

MANEWA KANDA

Environmentally Sensitive Area Co-Management Plan



**Co-Management Plan
Manewa Kanda Environmentally Sensitive Area
Ipalogama Divisional Secretariat Division
Anuradhapura District, Sri Lanka**

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Environmentally Sensitive Areas Co-Management Plan



**Enhancing Biodiversity Conservation and Sustenance of Ecosystem Services
in Environmentally Sensitive Areas (ESA) Project**

Ministry of Environment &
United Nations Development Programme

Message from the Ipalogama Local Management Committee

The Manewa Kanda Environmentally Sensitive Area (ESA) Co -Management Plan is the precious outcome of an extensive study and the participatory planning process. Being in close proximity to the Ritigala strict natural reserve, Kala Wewa National Park and Kahalla Pallakele Forest Reserve and Sanctuary. This ESA consists rich diversity of endemic flora and fauna species and diverse ecosystems . Therefore, it is considered as the ecological heart of Ipalogama Divisional Secretariat Division.

Based on the assessment of biodiversity baseline survey conducted by Biodiversity Secretariat, Ministry of Environment, consultations with Government and Non-Government stakeholders, community and Civil Organizations, the necessary administrative procedures and social measures were strategized through a Co Management Plan in order to achieve the socioeconomic development while conserving biodiversity and mitigating threats to the biodiversity in the Manewa Kanda ESA.

This co-management plan has paved the way for sustainable development in the Manewa Kanda ESA. Therefore, it is the shared responsibility of all of us to extend our commitment to implement this Co-Management Plan. The Ipalogama Local Management Committee would like to convey sincere thanks to all those who contributed to the process of developing this plan.

Chairman,
Ipalogama Local Management Committee

Divisional Secretariat , Civil Societies and Community, Local Environment Groups, the Forest Department , the Department of Wildlife Conservation, Central Environmental Authority, Provincial Department of Agriculture, Department of Agrarian Services, Land Use Policy Planning Department, Pradeshiya Sabhava , Survey Department, Sri Lanka Police, Sri Lanka Navy , Coconut Development Board , Representatives of Farmer Organizations, Private Institution, Samurdhi Development Authority, Provincial Irrigation Department, Mahaweli Development Authority, Provincial health Ministry, Provincial Tourism Ministry National Aquaculture Development Authority of Sri Lanka and Archeology Department.



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Ipalogama Divisional Secretariat Division
Anuradhapura District
Sri Lanka

May 2020

Local Management Committee
Ipalogama Divisional Secretariat Division

In Collaboration with
**Enhancing Biodiversity Conservation and Sustenance of Ecosystem
Services in Environmentally Sensitive Areas (ESA) Project**
Ministry of Environment
&
United Nations Development Programme

Abbreviation

ESA	Environmentally Sensitive Area
FD	Forest Department
DWC	Department of Wildlife Conservation
NWS & DB	National Water Supply and Drainage Board
CR PE	Critically Endangered Possibly extinct
CR	Critically Endangered
BR	Breeding Residence
DD	Data Deficient
DSD	Divisional Secretariat Division
EN	Endangered
EPA	Environmental Protection Areas
GND	Grama Niladari Division
LC	Least Concern
KOB	Kala Oya Basin
LMC	Local Management Committee
NE	Not Evaluated
NT	Near Threatened
IAS	Invasive Alien Species
UNDP	United Nations Development Programme
VU	Vulnerable

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Manewa Kanda ESA Co-Management Plan



1. Introduction to the Environmentally Sensitive Areas (ESA)

1.1 Background

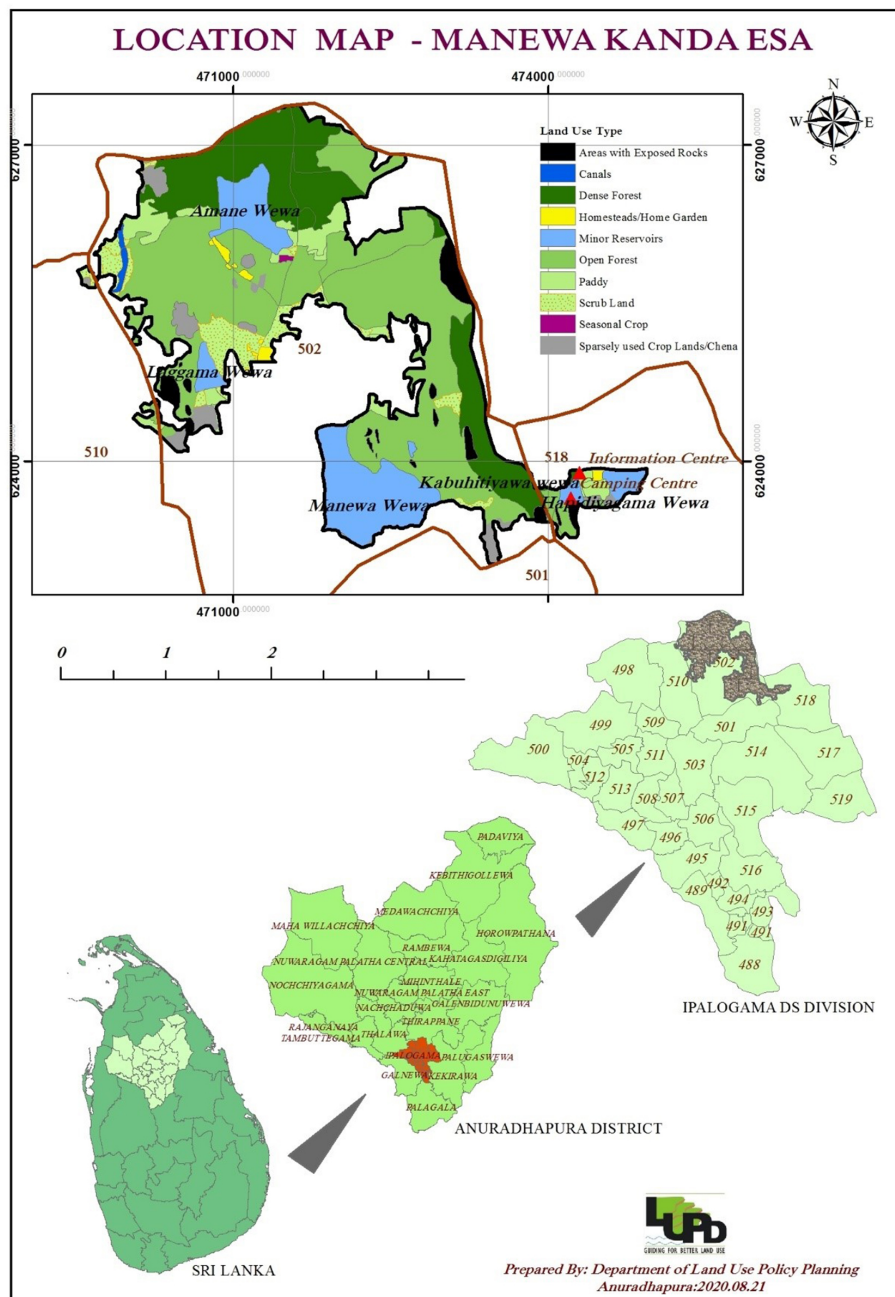
An Environmentally Sensitive Area (ESA) is a landscape element or an area with high biodiversity value, located outside of a protected area, and which needs to be managed through a co-management modality to conserve biodiversity and sustain ecological, environmental and socioeconomic benefits to the local communities as well as the nation and the globe at large. The primary purpose of the ESA is to achieve environmental sustainability in the country and minimize the threats to biodiversity depletion and sustenance of ecosystem services, specifically, in the selected area/targeted sites and incorporation of environmental values including ecological values, water quality and soil quality into the location based on other activities such as development and livelihood practices.

The ESA can also be seen as an area that is vital for the long-term maintenance of biodiversity and its evolutionary potential and/or the productivity of water, soil and other natural resources that provide ecological, environmental, economic and/or cultural benefits/ services primarily to the local community which requires co-management as applicable.

1.2 Manewa Kanda Environmentally Sensitive Area

Identified (and declared) *Manawe kanda* Environmentally Sensitive Area (ESA) is located in *Manewa kanda* forest cluster in 518 *Hinukwegama*, 501 *Ipalogama*, 502 *Manewa* and 510 *Kadiyangalla* GNDs in Divisional Secretariat Divisions in Anuradhapura District in Sri Lanka, and in close proximity to the existing and gazetted Protected Area network of *Ritigala* strict natural reserve, *Kala Wewa* National Park and *Kaballa Pallakele* Forest Reserve and Sanctuary. This ESA covers 855.86 hectares : 95 % of *Manewa* GND (816.09 ha) , 3.95 % *Hinukwegama* GND (33.77 Ha) 0.7 % of *Kadiyangalla* GND (5.99 ha), and 0.35 % *Ipalogama* GND (0.01 Ha). *Manewa kanda* forest cluster is a proposed forest reserve in *Kekirawa* beat in *Kekirawa* Range forest office with an extent of about 600ha. *Manewa kanda* consists three mountain peaks: *Hapidiyagama*, *Manewa* and *Kodi Gala*. Forest reserve range to South direction from the peak of mountain. Three villages are located in East direction of the mountain.

Figure 01 : Map of Geographical positioning and boundaries of Manewa Kanda ESA



As it is shown in the below Table 1, the total population of the ESA is 4905 in 1515 families and an average population density is 12.1 persons per square kilometer. This area consist mixed ethnic groups and majority of the population is Sinhalese, second Tamils and third place comes to Muslims. 23% of population is under the age of 16 years, 54% population between the age of 16 to 60 and 23% of are population is over 60 years.

42% of the population studied up to grade 5 or GCE Ordinary Level and 34% of population studied for advanced level or higher education.

65 % of the total population fall under labor force, out of which while 99 % engage in employment at local level and 1% in foreign employment. Majority of total families which is 52.18 % in whole are engaged in self-employment sectors, out of which around 93% of the families are engaged in agriculture, 3% in animal husbandry and 4% other industry. 15 % families of the population are engaged as daily labors in paddy fields , industries and depend on government subsidies.

While paddy farming in *Ipalogama*, *Kadiyangalla* and *Manewa* is done under major & minor irrigation, in *Hinukwegama* farming is done with rainfed and minor irrigation schemes. In addition to coconut , vegetable, fruit planting (Guvava and Papaya) and Other Food Crops (OFC) cultivation continue at home garden level. Drinking water scarcity is the major problem in the area and all families obtain water from unprotected water sources (open dug wells and river water). Housing/electricity and telecommunication facilities of the majority of families are at basic level.

Table 01: The Demographic data of the ESA Manaewa kanda.

GN Division	Total extent (ha)* of the GND	Extent of ESA (ha)	Families	Total population**	Population density/km2
518 <i>Hinukwegama</i>	664	33.77	206	605	121
501 <i>Iplaogama</i>	505	0.01	426	1380	690
502 <i>Manewa</i>	1397	816.09	313	961	97
510 <i>Kadiyangalla</i>	601	5.99	5170	1959	397
Total	3167	855.86	1515	4905	326.25

Source: *Land use planning office Anuradhapura; **Resource Profile, *Ipalogama DS*, 2019

This ESA is situated in the dry zone and located in D1b agroecological zone, where the period between Septembers to December is the rainy season while inter-monsoonal rains are expected between months of March to May. The annual temperature is between 27°C to 32°C and its annual rainfall is approximately 900 mm. The period of drought in the area extends from June to early September. The ESA is exposure to climate related natural hazards including prolonged droughts and frequent flash floods that negatively impact on livelihood of villagers as well as on the biodiversity. Prolonged droughts lead to reduction in mudflat areas and most of the tanks and water bodies dry up, while high rain fall results in the inundation of the mudflats and other habitats.

Main livelihood of the area population is agriculture, and animal husbandry (cattle, goat and poultry) while rest of families engaged in daily labor guava cultivation lands and

other cultivation lands. In addition to paddy cultivation (2 ½ Ac.) in the area, other field crops, vegetables, fruit planting and Other Food Crops (OFC) cultivation continuing as upland cultivations and home garden level.

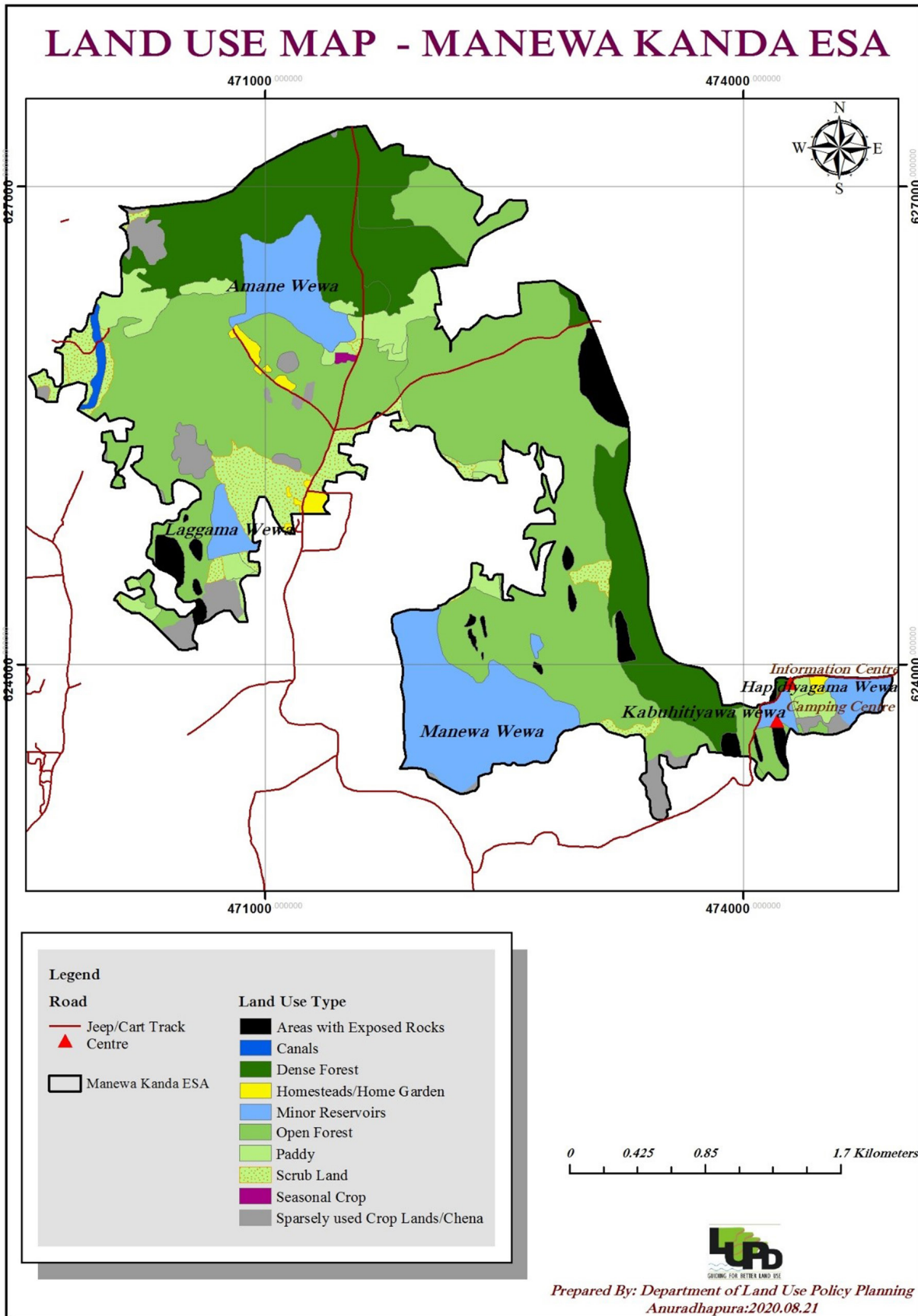
Present land use pattern of the ESA *Manewa Kanda* is shown in Map 2. Accordingly, the main land use within the area is forests (75 %) which consist of open forests (393.76 ha), followed by dense forest (174.95 ha) and scrub land (48.3 ha) . water bodies referred as second main land use(15%) and Agricultural land is reported as the third main land use (10%), with land under paddy cultivation (44.07 ha), chena cultivation (32.79 ha), home shed (7.09 ha) and seasonal crops (0.76 ha). More details of land use patterns are shown in Map 2 and given in Table No. 2.

Table 02: Main land uses/ land cover and their approximate extents in the ESA Manewa Kanda.

Land use_Type	501-Ipalogama (ha)	502-Manewa (ha)	510-Kadiyangalla (ha)	518-Hinukegama (ha)	Total (ha)	%
Forest						75%
Dense forest	0	173.5	0	1.45	174.95	20
Open forest	0	383.85	1.28	8.63	393.76	46
Scrub Land	0	46.52	1.77	0.01	48.3	6
Areas with exposed rock	0	23.44	0	2.44	25.88	3
Waier Bodies						15%
Canals	0	3.65	0	0	3.65	0
Minor reservoir(tank)	0	112.13	0	12.48	124.61	15
Agriculture						10%
Homestead/Home garden	0	5.95	0	1.14	7.09	1
Paddy	0	36.46	2.28	5.33	44.07	5
Seasonal crop	0	0.76	0	0	0.76	0
Sparsely used crop land/ Chena	0.01	29.83	0.66	2.29	32.79	4
Total Area(ha)	0.01	816.09	5.99	33.77	855.86	100

Source: *Land use planning office Anuradhapura; **Resource Profile, Ipalogama DS, 2019

Figure 02: Map of land use pattern on Manewa Kanda ESA



Source: *Land use planning office Anuradhapura; **Resource Profile, Ipalogama DS, 2019

There are five tanks located in *Manewa Kanda* ESA and details are given below. Those are: *Manewa*, *Hapitiyagama*, *Kadibhotoyawa*, *Loggama* and *Amane* tanks.

Table 03: Main water bodies in Manewa Kanda ESA.

GN Division	Tank	Irrigated land (Ac)		
		Water capacity (Ac/ft)	Yala(Ac)	Maha(Ac)
518-Hinukwegama	Hapidiyagama Wewa	18	23	19
	Kanduhitiyawa Wewa	16	15	12
502-Manewa	Manewa wewa	40	200	260
	Loggama	15	24	24
	Amane Wewa	85	70	70

Source: *Land use planning office Anuradhapura; **Resource Profile, Ipalogama DS, 2019

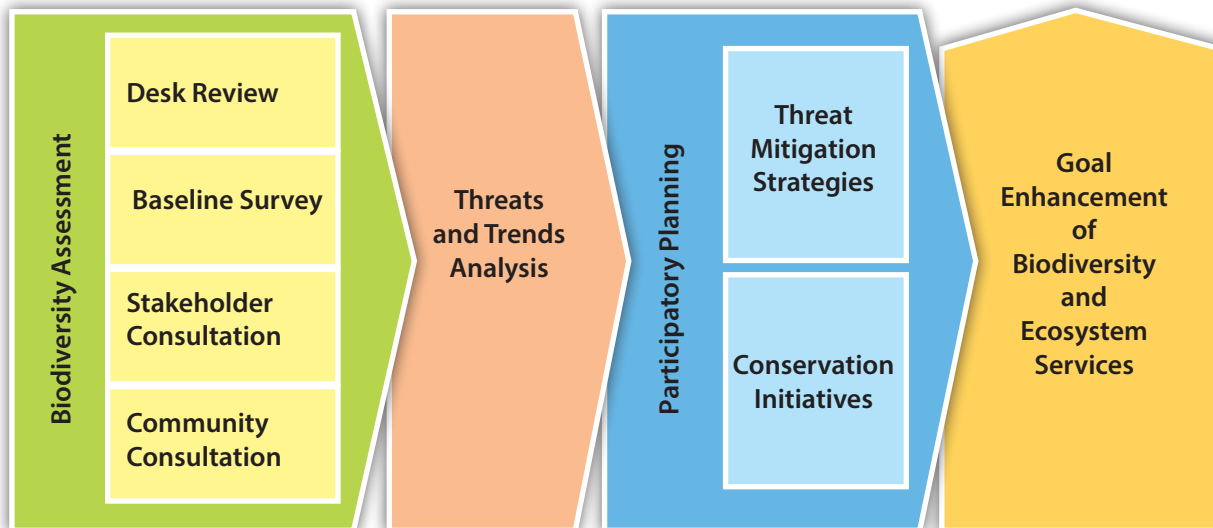
Manewa Kanda area was selected as an ESA site considering the high biodiversity significance and importance of ecosystem services. Specifically, Manewa Kanda was highlighted with the presence of endemic species, indigenous species, presence of nationally/globally threatened or endangered Species, overall richness of species as habitats that supports; Critical Natural History Processes, unique assemblages of species, critical for survival of threatened or endemic species, critical for survival of migratory species and ecosystem services.

1.3 Manewa Kanda ESA Co-Management Plan Development Process

Protection and conservation of biodiversity in an ESA entirely rely on the culture of natural resource management, which includes consideration of intergenerational needs and rights. Therefore, ESA management requires consent, commitment and contributions of individuals and institutions in and around the ESA. Following the above-mentioned principles and as indicated in Figure 1, the ESA Co-Management Plan was developed with the participation of communities concerned and the relevant government institutions.

The Co-Management Plan development process consists of three layers as detailed in Figure 3, namely, biodiversity assessment, threats and trends assessment and participatory planning. The biodiversity assessment was carried out in four stages, consisting of (i) the desk review – reviewing of various reports pertaining to the biodiversity in the area, (ii) the biodiversity baseline survey done by the biodiversity experts under the coordination of Biodiversity Secretariat, (iii) stakeholder consultations with government and non-government actors, and (iv) community consultations. The details of stakeholder consultations and community consultations are included in Annexure 1 of this Co-Management Plan.

Figure 03: Diagram of Management Plan Development Process.



Source: ESA Co-Management Plan, Ipalogama, 2019

Natural and anthropogenic threats were identified in consultation with stakeholders and communities and based on the scientific review of existing data. Meanwhile, the trends of socioeconomic and environmental risk to the biodiversity were assessed with previous incident timeline and forecasted considering natural phenomena and changes in population, economy and social development. Participatory planning was done to enhance biodiversity and ecosystem services in the ESA through threat mitigation strategies and conservation initiatives. The Co-Management planning process was administrated and approved by the Local Management Committee (LMC) of the Ipalogama DSD.

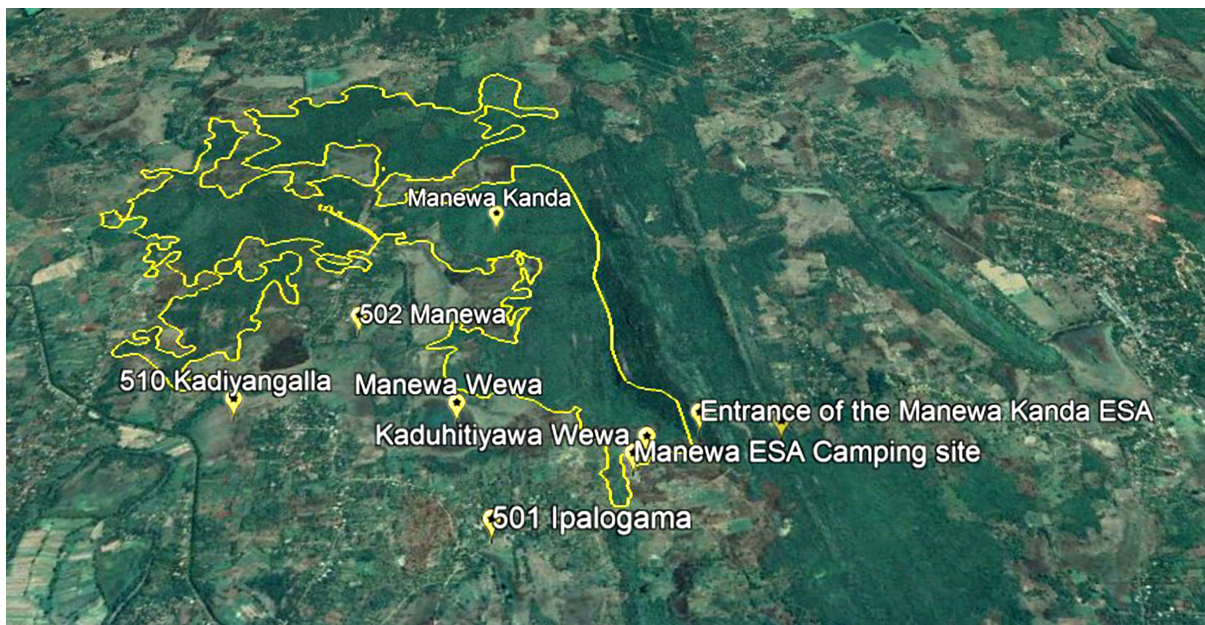


Figure 04: Satellite image of Manewa Kanda

2. Biological Diversity in Manewa Kanda ESA

2.1. Biodiversity Profile and Conservation Status of Species of the ESA

Manewa Kanda ESA is identified with high biodiversity. According to the biodiversity survey conducted in the area¹ found that the Dry Mixed Evergreen Forests, Disturbed forests, Scrub forests, Tank associated habitats, Chena and associated habitats offers home to total of 983 species belonging to seven taxonomic groups (609 plants, 19 Amphibians, 188 Birds, 43 Butterfly, 40 Dragonfly, 28 Mammals and 57 Reptiles).

Out of all species 65 endemic species were recorded (26 Plants , 04 Amphibians, 9 Birds, 1 Butterfly, 2 Dragonfly, 4 Mammals and 19 Reptiles) and 626 indigenous species (511 plants, 15 Amphibians, 38 Dragonfly, 24 Mammals and 38 Reptiles) were identified (Annexure 02)

Out of all these reported species, 93 threaten species (1 CR PE plant species, 8 critically endangered species, 22 endanger and 62 vulnerable species) were identified in Manewa Kanda ESA Site. In addition to that, among threaten species, 9 endemic plant species were recorded including 4 endanger and 5 Vulnerable species and 52 indigenous plant species were recorded including 1 CR PE Plant species, 3 Critically endanger plant species, 11 endanger species and 37 Vulnerable plant species (Annexure 03).

Out of recorded 19 Amphibian species, 1 indigenous amphibian species was recorded as Vulnerable and out of 40 dragonfly species, 2 indigenous species were recorded as vulnerable. From reported 28 mammals, 2 endemic species (1 Endanger & 1 Vulnerable) were reported and 5 indigenous species (3 endanger & 2 vulnerable) were reported. Out of 38 reptile species, 7 endemic species (1 CR, 1 Endanger, 5 Vulnerable) and 3 indigenous species (1 Endanger, 2 Vulnerable) were recorded as Threaten species (Annexure 03).

Forests in Manewa kanda ESA consistence of Dry Mixed Evergreen (DME) and tank associated forests, Dry Mixed Evergreen Forests – the main forest type in the dry zone as well as the Ipalogama DS Division. Manewa Kanda ESA has been identified as the isolated hill forest with high biodiversity.

1 The Biodiversity Assessment was carried out by Biodiversity expert group lead by Green Tech Consultants (Pvt.) (Ltd.), in 2017, under the coordination and supervision of the Biodiversity Secretariat of the Ministry of Mahaweli Development and Environment for the Environmentally Sensitive Areas Project.

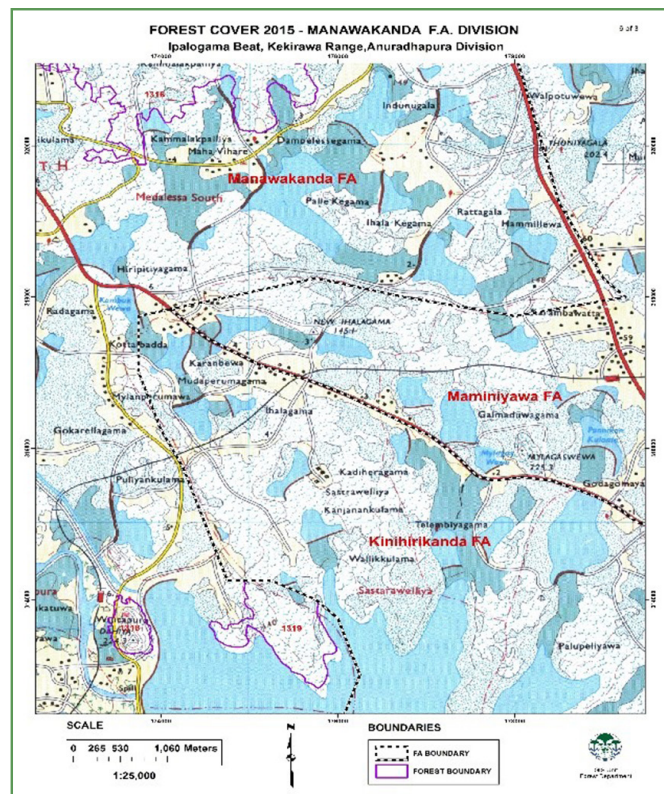


Figure 05: Map of the Manewa kanda FA Division

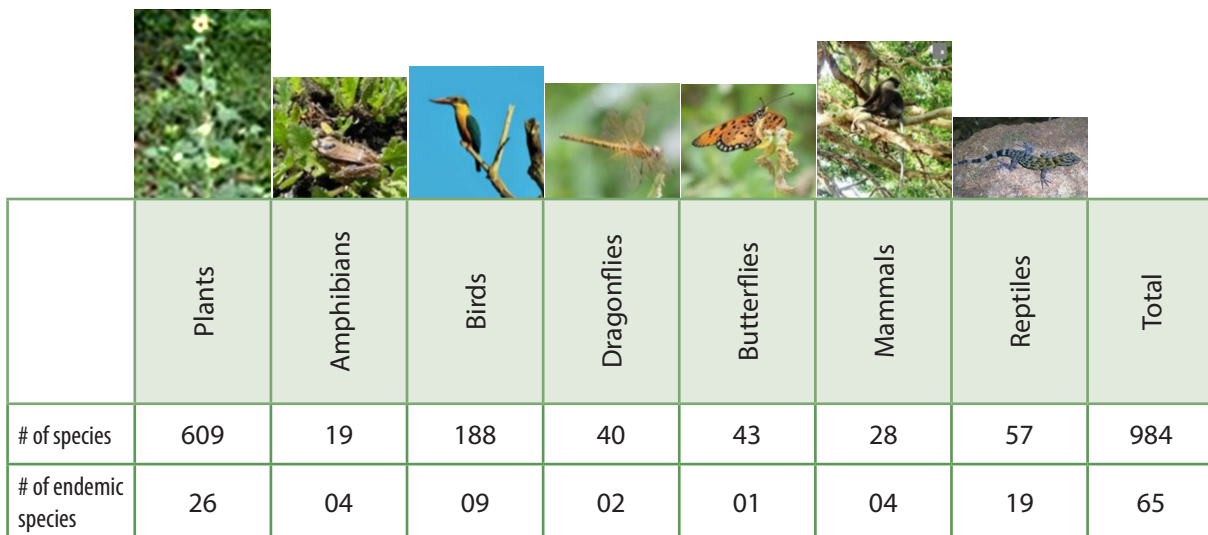


Figure 06: Species Diversity in Manewa Kanda ESA

Flowering plant diversity is high in the Dry Mixed Evergreen forest of Manawa Kanda. Among all mentioned habitat types endemic and indigenous trees, vines, bushes and herbs can be easily found and it was recorded 609 flora species with 26 endemic and 511 indigenous flora species. One critically endangered- possibly extent *Hibiscus panduriformis* Burm.f. species was recorded in Manewa Kanda ESA. Three critically endangered species *Aerva javanica* (Brum. f.) Juss. ex Schult., *Macrotyloma axillare* (E. Meyer) Verdc. & *Sauropus quadrangularis* (Willd.) Müll.Arg. were recorded and 15 endangered and 42 vulnerable fauna species were recorded.

Recorded number of Herpetofauna (Reptile and amphibians) species are 75 in the area, including 57 amphibians and 19 reptiles respectively. 04 endemic Amphibians and 15 indigenous amphibians were recorded in Manewa Kanda ESA and 19 endemic reptiles and 38 indigenous reptiles were recorded. Endangered species of a *Gecko Cnemaspis kumarasinghei*, and a skink - *Eutropis beddomii* and critically endangered *Nessia hickanala* were recorded in the area.

ManawaKanda, tank associated habitats invite both local and migratory birds. Manawa tank offers an important habitat for aquatic birds. Total of 188 bird's species were recorded in the area, nine endemic bird species, 37 migratory bird species. There are 137 migratory bird recorded for breeding residence. There were 11 threaten bird species including one bird is due to Critically Endangered (CR) status of the breeding residence (BR), 3 birds due to CR status of BR of 3 migratory birds. Further, nationally threatened *Chrysocolaptes festivus* (White-napped Wood pecker) had been recorded in Manewa kanda ESA.

Mammal diversity encountered for 28 species, within that 3 species are endemic, 24 species are indigenous. 4 endangered species and 3 species are listed as vulnerable species. Mammals were recorded in Dry mixed Evergreen forests, tank associated and Chena associated habitats. A few endangered species are *Elephas maximus maximus* (Sri Lankan Elephant), *Prionailurus viverrinus* (Fishing Cat) and *Semnopithecus vetulus* (Purple faced Monkey). One Vulnerable species *Lutra lutra* (Linnaeus, 1758)(otter) is recorded in Manewa kanda ESA. Near Threaten species of *Rusa unicolor* (Sambar Deer/ Moose), and *Manis crassicaudata* (Indian pangolin) species can be seen in the area.

In consideration of Invertebrate biodiversity, the area is famous for higher presence of butterflies and dragonflies. Among 42 butterflies were recorded, 1 endemic species the Sri Lanka Lesser Albatross, *Appias galena* can be seen in the area. The Common Crow butterfly had shown the highest density values in the area.

40 dragonflies were recorded including 2 endemic *Pseudagrion rubriceps* Selys, 1876 (Orange-faced Sprite) & *Prodasineura sita* (Kirby, 1894) (Stripe-headed Threadtail). Two vulnerable dragonfly species *Aciagrion occidentale* Laidlaw, 1919 (Asian Slim) & *Tramea basilaris* (Palisot de Beauvois, 1805) (Wheeling Glider) were recorded in Manewa Kanda ESA area.

Accordingly, out of all reported species 6% species are endemic and 63% are indigenous. most of them are plants. Among all reported species 9% are in threaten category.

The list of reported endemic species and threaten spp are given as Annexure 2 in this Management Plan.

6% Endemic
9% Endangered

2.1.1. Gene Diversity

Genetic diversity refers to both the vast numbers of different species as well as the diversity within a species. The greater the genetic diversity within a species, the greater that species' chances of long-term survival. This is because negative traits (such as inherited diseases) become widespread within a population when that population is left to reproduce only with its own members.

Genetic diversity is the total number of genetic characteristics in the genetic makeup of a species or is simply the variation of genes within species. Individuals within each species have a particular genetic composition and carrying out a gene pool. In order to survive, some species show adaptations to the changing environment and mutations. This caused changes in genes of species and therefore, offering new genetically improved individuals within the population, and different populations carry different genetic composition.

The baseline surveys didn't cover genetic diversity studies in Manewa kanda area or KOB, Hence there is no enough data related to gene diversity.

2.1.2. Species Diversity

Approximately 609 flowering plant species were recorded from the Manewa kanda ESA. *Hibiscus panduriformis* a rare shrub species of family Malvaceae which has been found only in very few locations in Sri Lanka was recorded in Manewa Kanda ESA. It consists endemic 26 species , 626 indigenouse plant species and 72 exotic plant species.

Manewa kanda has a high vertebrate diversity with conservation values as indicated in Table 3. Of the 28 mammalian species recorded, three species (*Macaca sinica*, *Semnopithecus vetulus hartii*, and *Moschiola meminna*) are endemic. Mega herbivores such as elephants are found migrating between protected areas and river basin, especially between *Kala-wewa* and *Kahalapallekele* Santury and within the habitats of Dry Mixed Evergreen Forest, Tank Associated and Chena Associated.

Manewa Kanda ESA is home to a significant diversity of birds including nationally and globally threatened migrant bird species and hence a higher number of bird species (102) were present. Manawa tank is an important habitat for aquatic birds, while the dry mixed forest patches associated with Manawakanda provides habitats for forest birds. 67 bird species were encountered within the 20 m of the VCPs, including seven endemic birds. Largest concentration of globally threatened *C. episcopus* was observed from this area. Presence of the nationally threatened *Chrysocolaptes festivus* (White-naped Wood pecker) added to the importance of this site. Forest clearing for Chena cultivation and the spread of invasive gini grass are the major threats.

Manewa kanda ESA is hot spot for 42 species of butterflies including 2 endemic species, the Sri Lanka Birdwing, *Troides darsius* and the Sri Lanka Lesser *Albatross*, *Appias galena* were recorded in this area. Amongst the butterflies recorded during the survey, the nationally threatened Banded Peacock, *Papilio crino*, and Silver Streak Blue, *Iraota timoleon* were also recorded. The Shannon index (H') was 4.27. According to the density values, the Common Crow showed the highest density values.

Nineteen species of amphibian species recorded and which included 5 families (*Bufonidae*, *Microhylidae*, *Dicroglossidae*, *Rhacophoridae* and *Ranidae*) and 12 genera (*Duttaphrynus*, *Kaloula*, *Microhyla*, *Ramanella*, *Uperodon*, *Euphlyctis*, *Zakerana*, *Hoplobatrachus*, *Sphaerotheca*, *Pseudophilautus*, *Polypedates* and *Hylarana*). A total of 75 herpetofauna species were recorded in this ESA site. It comprised of 19 amphibian reptile species. It included 2 endangered species, a gecko- *Cnemaspis kumarasinghei*, a skink- *Eutropis beddomii* and 1 critically endangered *Nessia hickanala*. There is a high diversity of herpetofauna concentrated in four types of eco systems in the area. This area consisted mainly of tanks and rocky pools. 181 individual Odonates belonging to 23 species were recorded with diversity index value of 2.4 in Manewa kanda ESA.

Table 04: Species at Manewa kanda ESA and Conservation Status

Conservation Status	Plant	Amphibian	Bird	Butterfly	Dragonfly	Mammals	Reptiles	Total
CR/PE	1	0	0	0	0	0	0	1
Critically Endangered	3	0	4	0	0	0	1	8
Endanger	15	0	1	0	0	4	2	22
Vulnerable	42	1	6	1	2	3	7	62
Near Threaten	63	1	19	0	8	2	10	103
Least Concern	403	15	157	42	30	19	37	703
Data Deficient	7	2	0	0	0	0	0	9
Not Evaluated	75	0	1	0	0	0	0	76
TOTAL	609	19	188	43	40	28	57	983

Figure 07 : Endemic Species according to the Conservation Status.

Endemic Species 65 (Plants 26 + Amphibians 4 + Birds 9 + Butterfly 1+ 2 Dragonfly +Mammals 4 + Reptiles 19)
CR 1 -(1 Reptile)
EN 6 -(1 Mammal + 1 Reptile + 4 plants)
VU 11- (Plant 5 + Mammal 1+ Reptile 5)
NT 9 -(Plant 5 + Amphibians 1 + Bird 1 + Reptile 2)
LC 36 -(Plants 12 + Amphibians 2 + Birds 7 + Butterfly 1+ Dragonfly 2+ Mammals 2 + Reptiles 10)
DD1- (Amphibians 1)
NE 1 -(Bird 1)

Figure 08: Indigenous/Native Species according to the Conservation Status.

Indigenous Species identified 626 (Plants 511 + Amphibians 15 + Dragon fly 38 + Mammals 24 + Reptiles 38)
CR/PE = 1 (1 Plant)
CR = 3 (3 Plants)
EN = 15 (11 Plants + 3 Mammals + 1 reptiles)
VU = 44 (37 Plants + 1 Amphibians + 2 Dragonfly + 2 Mammals + 2 reptiles)
NT = 76 (58 Plants + 8 Dragonfly + 2 Mammals + 8 Reptiles)
LC = 476 (391 Plants + 13 Amphibians + 28 Dragonfly+ 17 Mammals + 27 Reptiles)
DD = 8 (7 Plants + 1 Amphibian)
NE = 3 (3 Plant)

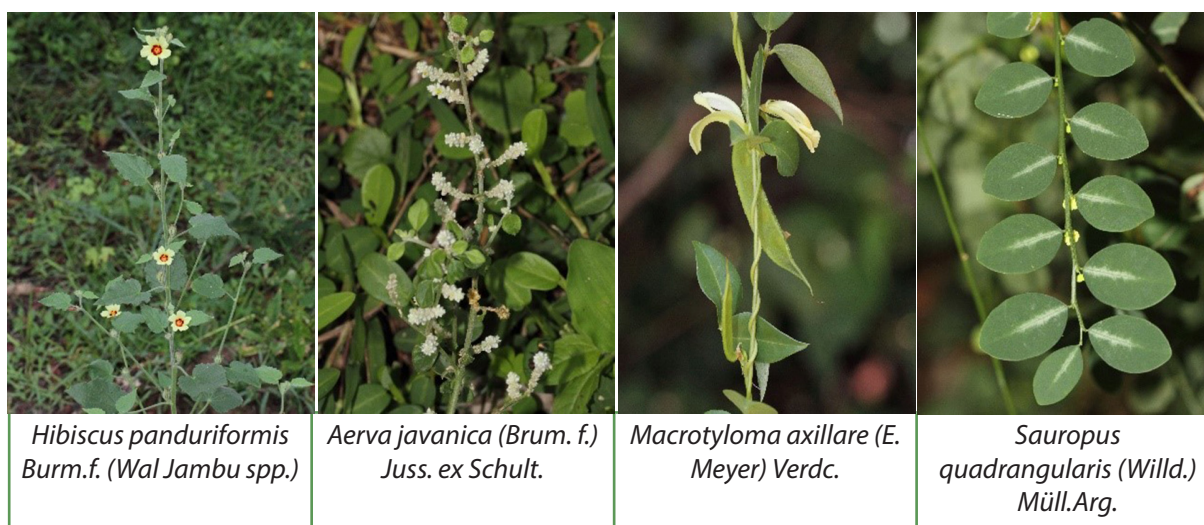


Figure 09: Critically Endangered Species in Manewa Kanda ESA.

Details of categories of species, species status and conservation status has included to the management plan as Annexure 2 & 3.

2.1.3. Ecosystem Diversity

The Manewa Kanda ESA represents a wide array of vegetation types covering terrestrial, forest and fresh water ecosystems. The main ecosystems identified for Manewa kanda ESA under this study included the following: Dry Mixed Ever Green Forests, Disturbed Forest, Rock pools and Scrub forest, Tank associate habitats and Chena associating habitats. Further dragonflies were also recorded within associated tank beds and rock .

A brief description of the most important Ecosystems found within the area is given below.

2.1.3.1. Forest eco system/Dry Mixed Ever Green Forest

Manewa kanda is an isolated hill of dry mixed evergreen forests remain in Ipalogama area and it is not properly demarcated and protected and surrounded by settlements and chena cultivations. Therefore, the hill serves as refugia for many plant and animal species. Although the foothill region of the site are heavily disturbed due to human activities, the upper forested area still support a good patch of Lowland dry forest which are the typical forests of this region. Since the human disturbance are relatively low in the upper regions of the hill most of the mammal species which are sensitive to disturbance have moved to the upper region of the hill, thus making this are as the only refugia for the survival of these species. Therefore, these isolated hills should be protected further by disturbance to save the remaining biological diversity in the area .

Common dominant canopy species are *Dialium ovoideum* Thwaites (*gal siyabala*), *Drypetes sepiaria* (Weera), *Chloroxylon swietania* DC.(*Burutha*), *Manilkara hexandra* (Roxb.) Dubard.(*Palu*), *Strychnos potatorum* L.f.(*Igini*), *Mischodon zeylanicus* , *Madhuca longifolia* (J.Koenig ex L.) J.F.Macbr. (*Mee*), *Crateva adansonii* DC.(*Lunu Warana*), *Diospyros ebenum* J.Koenig ex Retz.(*Kaluwara*) etc.



Figure 10: Dry Mixed Ever Green Forests in Manewa Kanda ESA



Picture: Tank associate habitats



Picture: Disturbed Forest



Picture: Chena associating habitats



Picture: some rock pools and Scrub forest

2.1.3.2. Tank associate habitats

Since ancient times, the northern dry zone was used as a cultivation ground where people made reservoirs to regulate the water availability throughout the year across different weather conditions. Some of these tanks still remain and furthermore new tanks have been built in the recent past. Hence tank associated habitats were present in a considerable extent of the land in the dry zone and can be recognized as a unique habitat type. This habitat can be divided in to three microhabitats namely tank upstream, water retaining section and tank downstream. Wet and boggy soil was a common feature for both these microhabitats. In the tank upstream habitats, the location of the boggy section varied to a considerable extent within the year according to the water level of the reservoir, but in downstream habitats it varied to a very little extent. Around Manewa Kanda ESA, the upstream habitats of most of tanks were disturbed by anthropogenic activities than the tank downstream habitats. People tend to encroach the tank thaula area and cultivate the upstream with out using sufficient soil conservation measures which is the major reason for the siltation of tank beds.

This Manewa kanda ESA includes a variety of habitats and hence a higher number of bird species (102) were present. Manawa tank is an important habitat for aquatic birds, while the dry mixed forest patches associated with Manawakanda provides habitats for forest birds. 67 bird species were encountered within the 20 m of the VCPs, including seven endemic birds. Largest concentration of globally threatened *C. episcopus* was observed from this area. Presence of the nationally threatened *Chrysocolaptes festivus* (White-naped Wood pecker) added to the importance of this site. Forest clearing for

Chena cultivation and the spread of invasive gini grass are the major threats. Dominant as well as the tallest tree species in this habitat were *Terminalia arjuna* (Kumbuk).

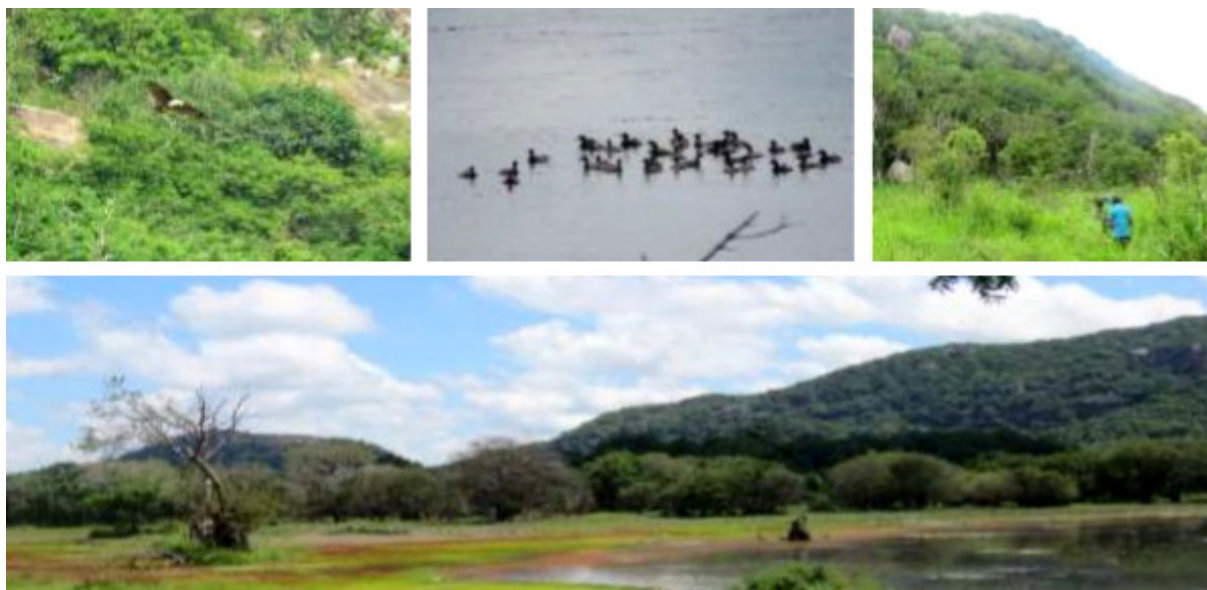


Figure 11: Habitat and Avifauna in Manewa kanda ESA

Most common aquatic plants recorded in these tank associated habitats are *Salvinia adnata* (Salviniaceae) and *Nymphaea pubescens* (Nymphaeaceae), followed by *Eichhornia crassipes* (Pontederiaceae) and then *Persicaria attenuata* (Polygonaceae) and *Neptunia oleracea* (Water mimosa),. Indigenous species were not very common, i.e. low in numbers and seems locally threatened and almost extinct. The common indigenous species are a variety of Cyperusspecies in the Family Cyperaceae, *Aponogeton crispus* (Aponogetonaceae), *Nymphaea pubescens* (Nymphaeaceae), and *Nelumbo nucifera* (Nelumbonaceae). However, red variety of lotus is not very common in the Wewa systems of ESA site.

2.1.3.3. Rock pools and associated habitats

Manewa kanda ESA consist with some rock pools and their associating vegetation. That includes some rock dwelling herbaceous species such as *Plectranthus barbatus*, *Orthosiphon thymiflorus* and trees such as *Ficus mollis*. But the flat terrain is almost infested by the invasive tall grass species *Panicum maximum*. This representative habitat is extended in to a considerable extent along the base of the hill. Remnants of this area indicates that it was burnt recently. Only very few trees as well as herbaceous species were found in this area due to the thickness of *Panicum* growth. The forested area is an archaeological site, which has a protection status. Disturbed forest quadrat was a small strip between two tanks which consisted of some trees covered by many lianas and vines.



Picture: Rock pools and associated habitat

2.1.3.4. Chena and associated habitats



Figure 12: Chena and associated habitat in Manewa kanda ESA

This was a highly disturbed habitat, which was cleared for Chena cultivation. Chena is cultivation practices that clears the forest and cultivate for 3-4 seasons and then again abandons it allow regeneration of the forest. Only one season per year is available for these farms since its water requirement depends directly on the Northeast monsoonal rains. After the harvesting, which takes place between February–March, the remaining crops are left idle and serves as a good food source for some wild animals such as elephants. Abandoned Chena and its marginal vegetation were assessed in this survey in 9 quadrats. Working Chena was not selected as quadrats.

Canopy cover of this habitat which varied from 5% to 40% averaged at 26.9%. There were no distinct canopy trees except remnants of the destroyed forest, which were used as shading trees during cultivation. *Bauhinia racemose* (Bidi leaf tree), *Grewia helicterifolia*, *Azadirachta indica* (Neem tree), *Grewia damine* and *Sapindus emarginatus* were the dominant pioneer tree species in these regenerating habitats. Most sun-loving herbs and shrubs described prior in other habitats types were also available in this habitat.

3. Threats to biodiversity in *Manewa Kanda* ESA

At the community consultation in 518-Hinukwegama GND, 501 *Ipalogama* and 502 *Manewa* direct and indirect threats for biodiversity management were identified. Following are the key threats to the biodiversity and the stakeholders including community representatives. For additional information please refer to the MK threat analysis map.

3.1.1. Encroachment of forest lands /*Manewa kanda*

Deforestation is a major cause of environmental degradation. Lack of land availability, widespread poverty and huge population pressure in surrounding environment are main frontier of deforestation. Clearing and burning of scrub forests and grasslands for cultivation purposes lead to the loss of grass cover/ reed beds/ mudflats for birds, and also contribute to increased pollution and siltation of the water bodies during the rainy seasons. During a field visit it was observed that chena cultivations take place legally as well as illegally. The farmers clear large tracks of jungle envisaging plentiful of rainwater, yet lack of rains led to poor returns, resulting in wastage, economic and massive environmental losses.

Hinukwegama being one the populated area and major community with interesting Guava cultivation tend to encroach forest lands and specially *Manewa kanda* which is surrounding with three villagers: *Hapidiyagama*, *Manewa* and *Gamini Halmillewa* villages. The forests are depleting mainly due to illegal logging and conversion to non-forestry uses specially for guava cultivation and chena cultivation/upland cultivations. Limited land availability have been identified as the major proximate causes of encroachment and, if no measures are adopted within near future the existing natural forests might be encroached (10 - 15 ha) and biodiversity in *Manewa kanda* is in high risk of extinction.



Picture: Deforestation of lands

3.1.2. IAS outside the ESA

IAS which is silent threat simply put, our biodiversity, economy, tourism, agriculture and health will decline with the effects becoming increasingly difficult to mitigate as the spread of IAS becomes impossible to contain. Most common ground IAS around

Manewa kanda ESA is Gini Grass & Lantana. There are other aquatic ISA which are water hyacinth and Salvenia in tanks and other water bodies. Biodiversity will suffer as IAS transform the structure and balance of species in natural systems as they suppress native species and reduce the quality and productivity of landscapes. Surrounding environment of Manewa kanda ESA have been recorded many IAS. Agriculture lands will suffer as IAS infestations result in direct loss of crops. IAS potentially act to suppress native species used by animals to forage, and therefore can decrease the productive area of farmland.



Figure 13: Common Invasive Alien Species in Manewa kanda ESA

3.1.3. Invasive Alien Species in Manewa Kanda

Spread of invasive alien terrestrial spp such as Lantana and Gini grass and aquatic plants such as *Hydrilla verticillata*, *Najas marina*, *Eichhornia crassipes* and *Salvinia molesta* could cause problems to the endemic biodiversity especially in surrounding tanks. Lantana and Gini grass are the most prominent IAS in Manewa kanda ESA site and it is adversely affect to the bio diversity of ESA site. Biodiversity of Mane Wakanda will suffer as IAS transform the structure and balance of species diversity of the forest and natural systems as they suppress native species. Other than the adverse effect of IAS, It could be observed most of small birds are depend on Gini grass seeds.

3.1.4. Forest fire around focus area of ESA

Forest fires have many implications for biodiversity. Further, IAS in surrounding area cause the forest fire which turns by humans coz they prefer to have young grass for fodder for livestock. They tend to fire to dried Gini grass . Some youths have do forest fire as a fun. Recurrent Forest fire damage the rich bio diversity in Manewa Kanda. Smoke from fires can significantly reduce photosynthetic activity) and can be detrimental to health of humans and animals. Hence some actions need to be taken.

3.1.5. Hunting and poaching

The main threats to the reserve are illegal timber felling, poaching and treasure hunting. However the officers judge that the timber felling and poaching has reduced drastically since the ESA project works. Forest Department expectation from sustainable tourism activities is to create awareness about the site and provide some income generation opportunities for the local community, which cause minimize the threats to adjacent biodiversity. Some site enrichment need to be done. The reserve lies along an elephant corridor, and during a certain season for about 3 months, there is a lot of elephant activity in certain areas of the reserve.

3.1.6. Drought & Land slides

Droughts can severely impact on human, natural environment, animal, agriculture and water resources. In Sri Lanka drought is frequently occurring in the Dry Zone areas with lack of rain water in particular cultivation seasons and years. The 2013/2014 drought has seriously damaged the agricultural production, biodiversity in forestry areas and none forestry areas. Water levels of the many tanks have been declined which badly affect to aquatic biodiversity and terrestrial biodiversity. Landslides had been traditionally considered as a minor type of disaster in this area and not a common occurrence in dry zone or in Manewa kanda area. However, it was observed two sudden land slides occurred in Manewa kanda and removed large patch of vegetation and adversely affected to biodiversity in Manewa kanda ESA.



Figure 14 : landslide and drought in Manewa kanda ESA

3.1.7. Mono cropping with unsustainable use of fertilizer and pesticides

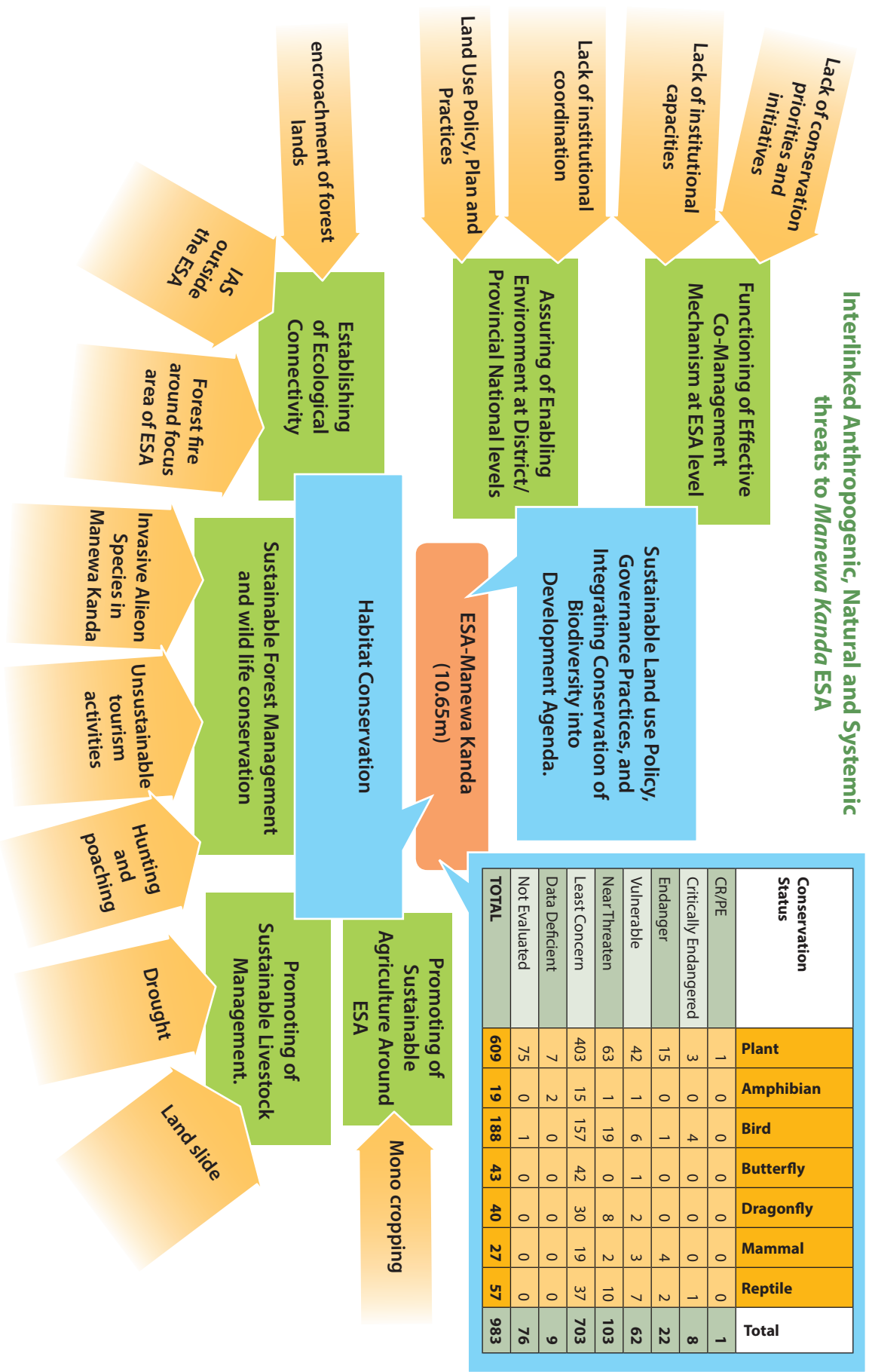
Chemicals are washed into the streams and tanks leading to pollution and eutrophication. High levels of nitrates and phosphates released from fertilizer application of the relevant catchments in the agricultural zones or from wastes released from urbanized areas cause nutrient enrichments in stagnant waters. Animal husbandry including cattle and goat rearing are popular in certain areas and excretion of these livestock also leads to eutrophication of reservoirs. Eutrophication increases the growth of nuisance algae, which release toxic substances to water during their degeneration, resulting in health problems to humans and disruption of the entire ecosystem. Eutrophication in water bodies also affects the larval stages of species such as dragonflies (Odonata).

In *Ipalogama* area around *Manewa kanda* ESA , it was observed the huge trend of growing guava as a commercial cultivation. As cost effectiveness is high with Guava, hence , Fertilizers applied by the farmers are many times higher than recommended standard application rate of the Department of Agriculture (DOA); due to over application of fertilizers by farmers neglecting or unawareness of the standard recommended application rates by the DOA.

3.1.8. Lack of Coordination among Implementing Agencies

Policy decisions at higher official levels without consideration or awareness of the ground level realities lead to confusion in managing the sensitive areas. A lack of coordination among relevant implementing agencies results in inefficient management, and insufficient communication. Issues at the ground level are not brought to the level where policies and legislative measures can be implemented.

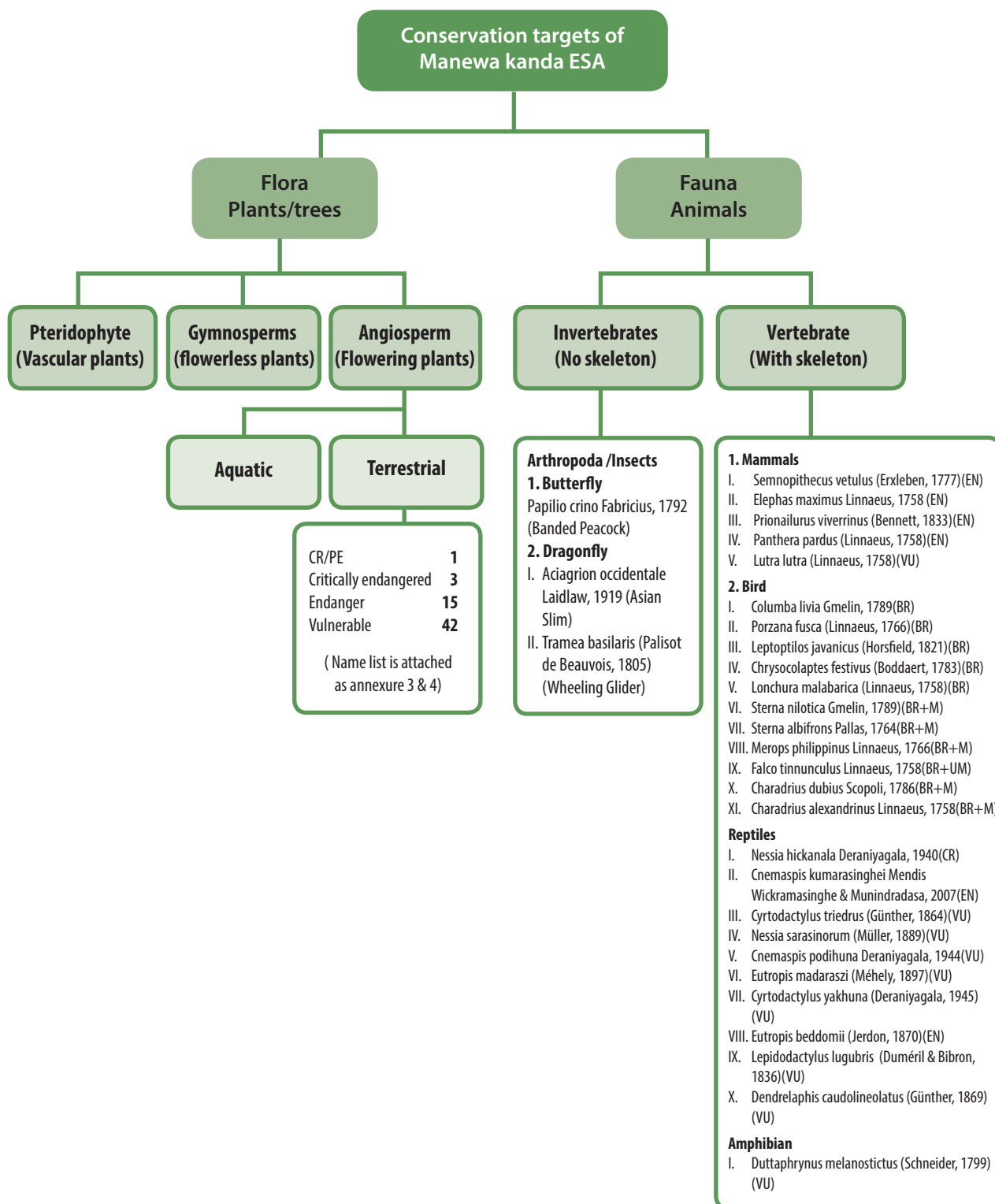
Interlinked Anthropogenic, Natural and Systemic threats to Manewa Kanda ESA



4. Co-Management Plan for Enrichment of Manewa Kanda ESA

4.1. Conservation targets of Manewa Kanda ESA

Based on the Biodiversity Assessment conducted in the area, a set of conservation targets were developed by the experts. Those targets were verified at the community and stakeholder consultations conducted in the *Ipalogama* ESA. Following is a summary of species level conservation targets finalized after the community and stakeholder consultations.



Since species level conservation targets are identified under the field survey, it was decided through an expert consultation to agree on overall conservation targets based on the threaten biodiversity component and threats experienced by the vulnerable biodiversity elements. Further the Land use Policy Planning Department identified key threats and underlying causes of those threats. Those identified threats were validated through the community and stakeholder consultations.

4.2. Goal and Strategic Interventions for Management of Biodiversity in Manewa Kanda ESA.

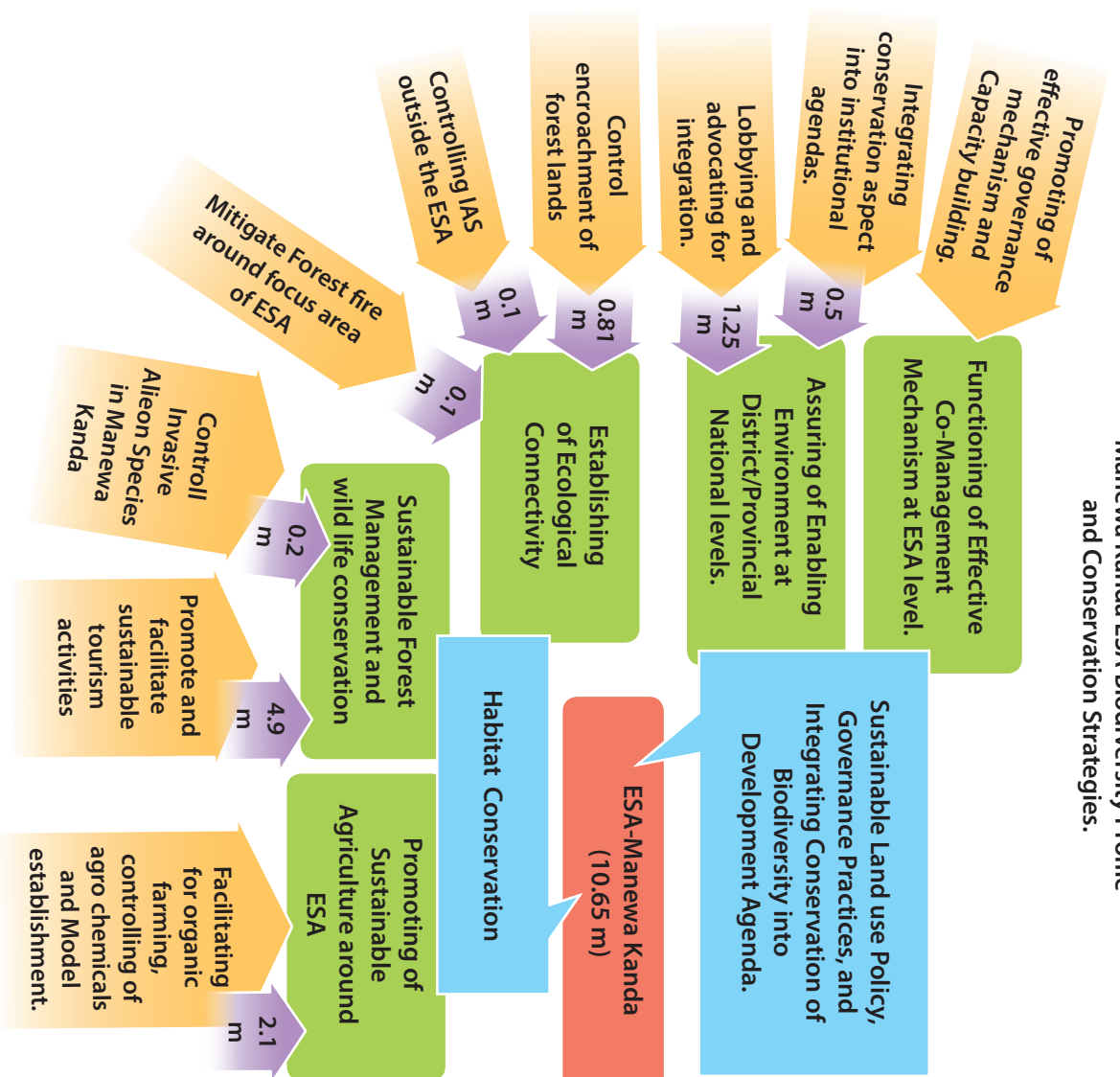
The co-management plan is implemented with the goal of introducing an enhanced governance mechanism on conservation of biodiversity through sustainable natural resources management for Conservation of biodiversity and ecosystem services in Manewakanda Environmentally Sensitive Area. It is expected to achieve through two outcomes: (i) Sustainable Land use Policy, Effective Governance Practices, and biodiversity conservation aspect integrated Development Agenda, and (ii) Enhanced Biodiversity and Ecosystem Services of Manewa Kanda Environmentally Sensitive Area through Habitat Conservation. There are five interventions under these two outcomes.

Table 05: Strategic interventions for Manewa Kanda ESA management

No.	Level	Description	Indicators
	Goal	Enhanced biodiversity and ecosystem services in Manewa Kanda Environmentally Sensitive Area that contributes to sustainable and healthy living condition of people and planet.	<ul style="list-style-type: none"> • Extent of improvement in habitat in Manewa Kanda. • Extent of impact of the especial measures taken to conserve threatened species. • Extent of effective contribution of stakeholders.
1.0	Outcome 1	Sustainable Land use Policy, Effective Governance Practices, and biodiversity conservation aspect integrated Development Agenda.	<ul style="list-style-type: none"> • Extent of availability, integration and implementation of area based – biodiversity friendly land use policy, plan and practices. • Amount of budgetary allocations made for conservation of biodiversity in ESA by stakeholders.
1.1	Strategic Intervention 1	Assuring of Enabling Environment at Divisional & District/ level.	<ul style="list-style-type: none"> • Developing a framework for upscaling and mainstreaming ESA in to District physical plans • Amount of budgetary allocations made by the District/Provincial level agencies for conservation

1.2	Strategic Intervention 2	Enhancing Effectiveness of Co-Management Mechanism at ESA level.	<ul style="list-style-type: none"> No. of relevant officials capacitated on ESA co-management, Identification and declaration of the Manewa Kanda ESA by the co-management authorities, Extent of integration of the interventions of ESA co-management plan into the sectoral/ institutional plans.
2.0	Outcome 2	Enhanced Biodiversity and Ecosystem Services of Manewa Kanda Environmentally Sensitive Area through Habitat Conservation.	<ul style="list-style-type: none"> Extent of species found at baseline survey remain healthy. Degree of reduction of habitat destruction and degradation, Extent of control of IAS.
2.1	Strategic Intervention 1	Establishing ecological connectivity between forest patches and water bodies around Manewa Kanda environmentally sensitive area	<ul style="list-style-type: none"> Percentage of ESA adjacent agriculture land transformed for sustainable agriculture. Degree of reduction of encroachment, forest fire and illegal tree felling,
2.2	Strategic Intervention 2	Promoting of Sustainable forest management and wildlife conservation	<ul style="list-style-type: none"> Availability and acceptability of Sustainable Tourism Plan for Manewa Kanda ESA, Extent of implementation of sustainable tourism plan Manewa Kanda.
2.3	Strategic Intervention 3	Promoting of Sustainable agriculture around ESA	<ul style="list-style-type: none"> Percentage of ESA adjacent agriculture land transformed for sustainable agriculture. Degree of reduction of encroachment, forest fire and illegal tree felling,
3.0	Outcome 3	Conservation of Threaten spp	<ul style="list-style-type: none"> Extent of Threaten species found at baseline survey remain healthy. Degree of reduction of habitat destruction and degradation, Number of threatened species conserved under especial conservation measures, Extent of control of IAS.
3.1	Strategic Intervention 1	Sustainable watershed management	<ul style="list-style-type: none"> Extent of restoration of watershed area, Slope stabilization and erosion control through cost-effective bioengineering and vegetative techniques; Low-cost water conservation and storage techniques, such as water-harvesting ponds, roof-water harvesting systems, and irrigation channels;

Manewa Kanda ESA Biodiversity Profile and Conservation Strategies.



Conservation Status	Plant	Amphibian	Bird	Butterfly	Dragonfly	Mammal	Reptile	Total
CR/PE	1	0	0	0	0	0	0	1
Critically Endangered	3	0	4	0	0	0	1	8
Endanger	15	0	1	0	0	4	2	22
Vulnerable	42	1	6	1	2	3	7	62
Near Threaten	63	1	19	0	8	2	10	103
Least Concern	403	15	157	42	30	19	37	703
Data Deficient	7	2	0	0	0	0	0	9
Not Evaluated	75	0	1	0	0	0	0	76
TOTAL	609	19	188	43	40	27	57	983

5. Proposed Policy Framework for Conservation of Biodiversity in Manewa Kanda ESA.

1. Environmentally sound, community centered and futuristic development-oriented zonation will be done in the Manewa ESA site in aligning of minimum standards of sustainable development;
2. In the zonation, it will be given due priority to maintain the maximum land extent of forest, maintain of buffer zones, watershed and small cascade systems and reservations for water bodies, agriculture areas including for traditional Chena cultivation .

Acknowledging of the value and responsibility of wise use of natural resources management for ecological, environmental and economic benefits, it is suggested to identify land utilization zones in Manewa kanda ESA as highly restricted area, restricted area and human activity allowed area etc.

Table 06 : Proposed Land Use Utilization Zones

Zone	Area	Allowed Activities	Activities that should be prohibited
Multiple use/ buffer zone 1 km around Manewa kanda	Settlements, industrial and agricultural area	Settlements, sustainable agriculture, other sustainable/ green industries, home garden developments and soil conservation measures.	Expansion or opening of new settlement or agricultural areas, or construction of any structures except through proper approvals as per existing legislations. Prohibited over usage pesticide and fertilizers and prohibits some crops which cause high soil erosion. (Tobacco)
Recreational/ Tourism potential	Manewa kanda camping site and Kaduhitiyawa tank area	Subject to carrying capacity: Boat rides, bird watching, bathing, camping, hiking, wildlife photography	Firing on camping beds, Littering, noise, poaching, breaking empty liquor bottles leaving a mess/Cutting/ Felling/ of tree species, collecting threatened plants, body parts of all fauna species
Requiring Strict protection	Selected sites in Manewa kanda ESA	Scientific research, Education and awareness, sustainable tourism with permits/ restrictions	Cutting/ felling trees /collecting threatened plants, body parts of all fauna species
Human- Elephant co-existence zones in buffer zone	Identified zones of elephant existence including migration	Activities that reduce Human Elephant Conflict (HEC) including selected type of agricultural activities	Haphazard constructions including elephant ditches, forest clearing

3. A survey will be carried out on the land ownership, utilization and future development prospects
4. Activities to be permitted to each zone need to be highlighted and rules and regulation need to be developed.
5. In allocation of land for individuals for agriculture purposes in the buffer zone of Manewa kanda ESA, it will be strict to the government land regulations; especially on maximum land area to ensure equitable access to natural resources for all.
6. Bio diversity profile and identified threaten spp need to be considered while issuing land permits, Gravel permits, tree felling and other human interactions.
7. Conditions will be imposed over the government land given on permit/lease for agriculture purposes to maintain a natural/plantation forest/connectivity between forest and adjacent water bodies .
8. Regulations will be imposed over the government land given on permit/lease for agriculture purposes on water , soil conservation and bio diversity conservation.
9. Priority will be given for demarcation of reservations of all watersheds; rivers, reservoirs, and forest etc. as a strategy of threat mitigation and participatory conservation activities will be implemented.
10. Over usage of agrochemical will be regulated through increasing of community awareness and accountabilities, promoting of good agriculture practices and effective law enforcement.
11. A Farmer's Information System will be developed, with linkages of government incentive/assistance schemes, to manage cultivation, usage of agrochemicals, market facilities, etc
12. Sustainable Tourism Plan will be developed and implemented under carrying capacity to meet the high potential of tourism development in the environmentally sensitive area.
13. Waste management in ESA area will be given high priority at all spheres; domestic, institutional and industrial.

6. Project Log Frame

Table 07: Financial Plan for Manewa Kanda ESA

No	Proposed Activity	ESA Budget						Key Agencies	Time line 2020				
		Up to 2020	Total Budget	Community Contribution	Private Sector Contribution	Government Contribution	ESA Project		August	September	October	November	December
1	Establishing of Ecological Connectivity												
1.1.	Preparation and implementation of Business model for MK ESA	100,000.00	1,355,000.00	75,000.00		80,000.00	1,200,000.00	FD					
2	Promoting of Sustainable Agriculture												
2.1	Conduct awareness programs to regularize fertilizer and pesticide over usage and regulation to 100 farmers around ESA Focus area and Promote and introduce GAP certification for major Guvava cultivation croplands	50,000.00	1,300,000.00	250,000.00		450,000.00	600,000.00	PDOA					
	Establishing Agrochemical waste management and sustainable financing system and Facilitating for organic farming, controlling of agro chemicals and establish 5 economically viable sustainable chena model around MK focus area		345,000.00	15,000.00		55,000.00	275,000.00	PDOA					
	Mango model with other fruits incorporation for 15 farmers		1,070,000.00	500,000.00		45,000.00	525,000.00	PDOA					
	Lime gardens (1/2-1Ac)- establishments to mitigate HEC in Happidiyagama, Manewa for 15 farmers		400,000.00	125,000.00		50,000.00	225,000.00	PDOA					
	Nelli cultivation (Beheth)/ Aberella Cultivation for 15 Farmers		400,000.00	125,000.00		50,000.00	225,000.00	PDOA					
2.3	Introduce perennial fruits to soil conservation bunds incorporated with Pagiri mana in upper catchment areas of Manewa, Hapidiyagama and Machchagama tanks		495000	150,000		45,000	300,000	PDOA					
3	Sustainable Watershed management												
3.1	Studying and initiate precaution actions against on harmful IAS and Algae and initiate compost production with WBO		510,000.00	10,000.00		100,000.00	400,000.00	DAD					
3.2	Identify and create market oriented IAS production(Hats, purse etc) - Conduct training for WBO and create market in MK premises.		350,000.00	50,000.00		100,000.00	200,000.00	DAD/DS					
3.3	Establish organic home gardens in Manewa and Hinukwegama Divisions		550,000.00	50,000.00		100,000.00	400,000.00	DAD					
3.4	Replanting of Threaten plant species in tank ecosystems for Migratory birds (budgeted under 1.2)							DAD					

No	Proposed Activity	ESA Budget						Key Agencies	Time line 2020				
		Up to 2020	Total Budget	Community Contribution	Private Sector Contribution	Government Contribution	ESA Project		August	September	October	November	December
3.5	Establish Micro land uses (Perahana, Galgommana and Kattakaduwa) , live fence in tank ecosystem (Kaduhitiyawa, Machchalagama , Hapidiyagama tanks) and Introduce soil conservation measures to upland cultivations in Manewa tank and Machchagama tank which are the breeding ground for dragonfly and amphibians and migratory birds. (20 Ac)		725,000.00	50,000.00		75,000.00	600,000.00	DAD					
3.6	Home garden development with multi special crop introduction around MK ESA		500,000.00	25,000.00		75,000.00	400,000.00	DS Ipalogama					
4	Conservation of threaten spp in Manewa Kanda												
4.2	Facilitate University students to conduct research on MK BD evenness and economical valued trees and address results on introducing threaten and valued fauna spp		410,000.00	15,000.00	100,000.00	45,000.00	250,000.00	PS- Ipalogama					
4.4	Conduct two awarens program on ESA/BD Conservation in MK ESA area for government staff (Divisional level and District level) and create open forum to dialog with district environment pioneers/NGOs/ leaders		215,000.00			15,000.00	200,000.00	DS- Ipalogama					
5	Sustainable Forest Management and wild life conservation												
Total		150,000.00	8,625,000.00	1,440,000.00	100,000.00	1,285,000.00	5,800,000.00						

Annexure 1

Details of stakeholder consultations and community consultations.



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Enhancing Biodiversity Conservation and Sustenance of Ecosystem Services in Environmentally Sensitive Areas (ESA)

Summary information on Stakeholder Consultation:

- Biodiversity cluster (Terrestrial)
- Biodiversity cluster (Water)
- Industrial Development cluster & Agriculture Cluster
- Agriculture Cluster
- Regional Development and Disaster Management

#	Institution	Clusters and Workshop Date					
		Workshop on community mobilization 3rd/4th June 2019	Biodiversity cluster- Terrestrial 11th June 2019	Biodiversity cluster- Water 13th June 2019	Industrial Development 26th June 2019	Agriculture Cluster 27th June 2019	Regional Development and Disaster Cluster 07th July 2019
1	District Secretariat -Anuradhapura	Yes	Yes	Yes	Yes	Yes	Yes
2	Forest Department		Yes	Yes	Yes	Yes	Yes
3	Department of Wildlife Conservation-		Yes	Yes	Yes	Yes	Yes
4	Central Environment Authority		Yes	Yes	Yes	Yes	Yes
5	District Disaster Management Co. Unit						Yes
6	NC provincial Agriculture Department		Yes	Yes		Yes	Yes
7	District Agriculture Department			Yes			
8	Agrarian Service Department-DO		Yes	Yes		Yes	Yes
9	Archaeology Department,		Yes	Yes		Yes	Yes
10	Police -Ipalogama		Yes		Yes	Yes	
11	Geological Survey Minds Bureau		Yes	Yes			Yes

12	Local Government Authority (Pradeshiya Sabawa Ipalogama)		Yes	Yes	Yes	Yes	Yes
13	Road Development Authority					Yes	
14	National Aquaculture Development Authority					Yes	
15	Mahaweli Development Authority		Yes	Yes	Yes	Yes	Yes
16	Irrigation Department (Provincial and National), AD			Yes	Yes		Yes
17	Fishery Department-Anuradhapura			Yes	Yes		Yes
18	NWS&DB-Anuradhapura			Yes	Yes		
19	Institute of Post harvest technology-Anuradhapura					Yes	
20	Animal health and vet nary-Ipalogama				Yes		
21	Coconut development Board					Yes	
22	Land use planning division-Anuradhapura		Yes	Yes	Yes	Yes	Yes
23	Vidatha officer-Ipalogama		Yes	Yes			
24	Survey Department						
25	Small Industry development Division						
26	DS office Ipalogama- DS, ADP and 12 EDOs	Yes	Yes	Yes	Yes	Yes	Yes
27	DS office Galnewa- DS, ADP and 10 EDOs	Yes	Yes	Yes	Yes	Yes	Yes
28	Ministry of Mahaweli Development and Environment	Yes	Yes	Yes		Yes	Yes
29	CBO-NGO participation						
30	Geological survey and mine burau		Yes		Yes		Yes
31	National Building Research Organization						Yes

Community Consultation Programs and Participation Summary List

#	GN Division	Conducted Date	Total Participation	Male	Female
1	518-Hinukwegama	12th June 2019	45	16	29
2	488-Walawegama	12th June 2019	68	25	43
3	502-Manewa	24th June 2019	92	38	54
4	516-Puliyankulama	24th June 2019	74	29	45
5	490-Kalawewa	25th June 2019	78	34	44
6	493-Vijithapura	12th June 2019	60	43	17
7	515-Hiripitiyagama	25th June 2019	77	23	54
8	517-Dampallessagama	25th June 2019	50	20	30
9	510-Kadiyangalla	28th June 2019	75	24	51
10	501-Ipalogama	28th June 2019	70	32	38
11	514--Kunchchikulama	28th June 2019	44	24	18
12	519-Ihala Kagama	28th June 2019	57	17	40

Annexure 2

List of reported Endemic Species in Manewa Kanda ESA.

Sub Basin	BD Group	Family	Scientific Name	English Name	Sinhala Name	Conservation Status
502 Manewa	Reptile	Scincidae	<i>Nessia hickanala</i> <i>Deraniyagala, 1940</i>	Sharkhead snakeskink	මෝරහිස් සර්පහිරළුවා	Critical Endanger
502 Manewa	Mammal	Cercopithecidae	<i>Semnopithecus vetulus</i> <i>(Erxleben, 1777)</i>	Sri Lanka Purple-faced langur/Sri Lanka Purple faced leaf monkey	ශ්‍රී ලංකා කළුවඳුරා	Endanger
502 Manewa	Plant	Amaranthaceae	<i>Achyranthes diandra</i> Roxb.		No Sinhala Name	Endanger
502 Manewa	Plant	Dioscoreaceae	<i>Dioscorea trimenii</i> Prain & <i>Bukill</i>		දෙහිය අල	Endanger
502 Manewa	Plant	Malvaceae	<i>Abutilon subumbellatum</i> <i>Philcox</i>		No Sinhala Name	Endanger
502 Manewa	Plant	Rubiaceae	<i>Diyaminauclea zeylanica</i> <i>(Hook.f.) Ridsdale</i>		දිය මී	Endanger
502 Manewa	Reptile	Gekkonidae	<i>Cnemaspis kumarasinghei</i> <i>Mendis Wickramasinghe &</i> <i>Munindradasa, 2007</i>	Kumarasinghe's day gecko	කුමාරසිංහගේ දිවාසර් හුනා	Endanger
502 Manewa	Reptile	Gekkonidae	<i>Cyrtodactylus triedra</i> <i>(Günther, 1864)</i>	Spotted bowfinger gecko	පුල්ලි වකනිය හුනා	Vulnerable
502 Manewa	Reptile	Scincidae	<i>Nessia sarasinorum</i> (Müller, 1889)	Sarasin's snakeskink	සරසිංහගේ සර්ප හිරළුවා	Vulnerable
502 Manewa	Reptile	Gekkonidae	<i>Cnemaspis podihuna</i> <i>Deraniyagala, 1944</i>	Dwarf day gecko	කුඩා දිවාසර් හුනා /පොඩි ගල් හුනා	Vulnerable
502 Manewa	Reptile	Scincidae	<i>Eutropis madaraszii</i> (Méhely, 1897)	Spotted skink	පුල්ලි හිකනලා	Vulnerable
502 Manewa	Reptile	Gekkonidae	<i>Cyrtodactylus yakhuna</i> <i>(Deraniyagala, 1945)</i>	Blotch bowfinger gecko / Demon gecko	ලපවන් වකනිය හුනා/යක් හුනා	Vulnerable
502 Manewa	Amphibians	Bufo	<i>Duttaphrynus atukoralei</i> <i>(Bogert & Senanayake,</i> <i>1966)</i>	Atukorale's toad	අතුකෝරාලගේ ගෙමිඩා	Near Threaten
502 Manewa	Bird	Phasianidae	<i>Galloperdix bicalcarata</i> (J. R. <i>Forster, 1781)</i>	Sri Lanka Spurfowl	ශ්‍රී ලංකා හඬන් කුකුළා	Near Threaten
502 Manewa	Plant	Acanthaceae	<i>Dicliptera neesii</i> (Trimen) <i>L.H. Cramer</i>		No Sinhala Name	Near Threaten
502 Manewa	Plant	Loganiaceae	<i>Strychnos benthami</i> C.B. <i>Clarke</i>		No Sinhala Name	Near Threaten
502 Manewa	Plant	Putranjivaceae	<i>Drypetes gardneri</i> <i>(Thwaites) Pax & Hoffm.</i>		ගල් වීර, අඳව වීර, යකිල්ල	Near Threaten
502 Manewa	Plant	Rubiaceae	<i>Pavetta gleniei</i> Thwaites ex <i>Hook.f.</i>		ගල් හැඹැල්ල, වීළ තෙරණ	Near Threaten

Sub Basin	BD Group	Family	Scientific Name	English Name	Sinhala Name	Conservation Status
502 Manewa	Plant	Rutaceae	<i>Murraya gleniei Thwaites ex Oliv.</i>		No Sinhala Name	Near Threaten
502 Manewa	Reptile	Agamidae	<i>Calotes ceylonensis Müller, 1887</i>	Painted lip lizard	තොල විසිතුරු කටුස්සා	Near Threaten
502 Manewa	Reptile	Scincidae	<i>Dasia haliana (Haly & Nevill, 1887)</i>	Haly's treeskink	හේලියේ රක් හීරළුවා	Near Threaten
502 Manewa	Amphibians	Rhacophoridae	<i>Polypedates cruciger: Blyth, 1852</i>	Common hour-glass tree frog	සුලබ පැතිඹු ගස් මැඩියා	Least Concern
502 Manewa	Amphibians	Ranidae	<i>Hylarana serendipi (Biju et al., 2014)</i>	Sri Lankan golden-backed frog	No Sinhala name	Least Concern
502 Manewa	Bird	Phasianidae	<i>Gallus lafayetii Lesson, 1831</i>	Sri Lanka Junglefowl	ශ්‍රී ලංකා වලි කුකුළා	Least Concern
502 Manewa	Bird	Columbidae	<i>Treron pompadora (Gmelin, 1789)</i>	Sri Lanka Green-pigeon	පීට දුම් බටගොයා / බටගොයා	Least Concern
502 Manewa	Bird	Bucerotidae	<i>Ocyrceros gingalensis (Shaw, 1811)</i>	Sri Lanka Grey Hornbill	ශ්‍රී ලංකා අලි කෘදුක්තා	Least Concern
502 Manewa	Bird	Ramphastidae	<i>Megalaima rubricapillus (Gmelin, 1788)</i>	Sri Lanka Small Barbet/ Crimson-fronted Barbet	රත් මුණත් කොට්ටෝරුවා / හීන් කොට්ටෝරුවා	Least Concern
502 Manewa	Bird	Campephagidae	<i>Tephrodornis affinis Blyth, 1847</i>	Sri Lanka Woodshrike	වන කොවුල් ඇස්පැරියා	Least Concern
502 Manewa	Bird	Pycnonotidae	<i>Pycnonotus melanicterus (Gmelin, 1789)</i>	Sri Lanka Black-capped Bulbul	ශ්‍රී ලංකා හිස කළු කොන්ඩියා	Least Concern
502 Manewa	Bird	Timaliidae	<i>Pellorneum fuscicapillus (Blyth, 1849)</i>	Sri Lanka Brown-capped Babbler	ශ්‍රී ලංකා බොරග පිර දෙමළුවීවා	Least Concern
502 Manewa	Butterfly	Pieridae	<i>Appias galene (Felder & Felder, 1865)</i>	Sri Lanka Lesser Albatross	ශ්‍රී ලංකා තුණ්ඩු දිගුපත් සමනලයා	Least Concern
502 Manewa	Dragonfly	Coenagrionidae	<i>Pseudagrion rubriceps Selys, 1876</i>	Sri Lanka Orange-faced Sprite	No Sinhala names	Least Concern
502 Manewa	Dragonfly	Protoneuridae	<i>Prodasineura sita (Kirby, 1894)</i>	Sri Lanka Stripe-headed Threadtail	No Sinhala names	Least Concern
502 Manewa	Mammal	Cercopithecidae	<i>Macaca sinica (Linnaeus, 1771)</i>	Sri Lanka Toque Monkey	ශ්‍රී ලංකා රිලුවා	Least Concern
502 Manewa	Mammal	Tragulidae	<i>Moschiola meminna (Erleben, 1777)</i>	Sri Lanka mouse-deer	ශ්‍රී ලංකා මිමින්නා	Least Concern
502 Manewa	Plant	Acanthaceae	<i>Rhinacanthus polonnaruwensis L.H. Cramer</i>		No Sinhala Names	Least Concern
502 Manewa	Plant	Achariaceae	<i>Hydnocarpus venenata Gaertn.</i>		මකුළු, මකුල, මකුල්ල, මකිරිය	Least Concern
502 Manewa	Plant	Annonaceae	<i>Uvaria sphenocarpa Hook. f. & Thomson</i>		No Sinhala Names	Least Concern
502 Manewa	Plant	Asteraceae	<i>Vernonia zeylanicum (L.) Less.</i>		හීන් බෝටිය, පුපුල, වල් පුපුල	Least Concern

Sub Basin	BD Group	Family	Scientific Name	English Name	Sinhala Name	Conservation Status
502 Manewa	Plant	Celastraceae	<i>Cassine balae</i> Kosterm.		නෙරළු	Least Concern
502 Manewa	Plant	Commelinaceae	<i>Murdannia spirata</i> (L.) G.Brückn.		No Sinhala Names	Least Concern
502 Manewa	Plant	Euphorbiaceae	<i>Mallotus eriocarpus</i> (Thwaites) Müll. Arg.		බුළු පෙන්න, වැල් කැප්පෙරියා	Least Concern
502 Manewa	Plant	Fabaceae	<i>Derris parviflora</i> Benth.		කල වැල්, සුදු කල වැල්	Least Concern
502 Manewa	Plant	Lamiaceae	<i>Premna procumbens</i> Moon		ලේ කොළ පළා	Least Concern
502 Manewa	Plant	Malvaceae	<i>Diplodiscus verrucosus</i> (Thwaites) Kosterm.		දික්වැන්න, දික් ඇන්ද	Least Concern
502 Manewa	Plant	Melastomataceae	<i>Memecylon capitellatum</i> L.		දැලි කහ, දොඩන්කහ, වැල් කහ, වැලි කහ, ඉදුල් ගහ, අඳුන්, කායම්	Least Concern
502 Manewa	Plant	Rutaceae	<i>Micromelum minutum</i> Wight & Arn.		වල් කරපිංවා	Least Concern
502 Manewa	Reptile	Gekkonidae	<i>Hemidactylus depressus</i> Gray, 1842	Kandyan gecko	හැලිගේ නූනා	Least Concern
502 Manewa	Reptile	Gekkonidae	<i>Hemidactylus lankae</i> Deraniyagala, 1953	Termite hill gecko	නුඹස් නූනා	Least Concern
502 Manewa	Reptile	Scincidae	<i>Lankascincus fallax</i> (Peters, 1860)	Common lankaskink	සුළඹ ලක් හිකනලා	Least Concern
502 Manewa	Reptile	Colubridae	<i>Chrysopelea taprobanica</i> Smith, 1943	Striped flying snake	දැහර දණ්ඩා	Least Concern
502 Manewa	Reptile	Uropeltidae	<i>Rhinophis oxyrhynchus</i> (Schneider, 1801)	Schneider's earth snake	උල් තුඩුල්ලා	Least Concern
502 Manewa	Reptile	Agamidae	<i>Otocryptis nigrigemma</i> Bahir & Silva, 2005	Black spotted kangaroo lizard	වියළි පිනුම් කටුස්සා	Least Concern
502 Manewa	Reptile	Trionychidae	<i>Lissemys ceylonensis</i> (Gray, 1856)	Flapshell turtle	කිරි ඉඹ්බා	Least Concern
502 Manewa	Reptile	Scincidae	<i>Eutropis tammanna</i> Das, De Silva & Austin, 2008	Tmmanna skink	තම්මන්නා හිකනලා	Least Concern
502 Manewa	Reptile	Natricidae	<i>Xenochrophis asperrimus</i> (Boulenger, 1891)	The checkered keelback	දිය පොළො/ දිය බරියා	Least Concern
502 Manewa	Reptile	Colubridae	<i>Lycodon osmanhilli</i> Taylor, 1950	Flowery wolf snake	මල් රඳුනකයා	Least Concern
502 Manewa	Amphibians	Rhacophoridae	<i>Pseudophilautus regius</i> (Manamendra-Arachchi & Pethiyagoda, 2005)	Polonnaruwa shrub frog	රජ රට පඳුරු මැඩියා	Vulnerable
502 Manewa	Bird	Picidae	<i>Dinopium psarodes</i> (A. A. H. Lichtenstein, 1793)	Sri Lanka Lesser Flame back	ශිභිපිට පිලි - කැරලා	Not Evaluated

Summary of Endemic Species in Manawekanda

Endemic Species 65 (Plants 26 + Amphibians 4 + Birds 9 + Butterfly 1+ 2 Dragonfly +Mammals 4 + Reptiles 19)	Conservation Status	Plants	Amphibians	Birds	Butterfly	Dragonfly	Mammals	Reptiles	Total
	CR/PE	0	0	0	0	0	0	0	0
CR 1 (1 Reptile)	Critically Endangered	0	0	0	0	0	0	1	1
EN 6 (1 Mammal + 1 Reptile + 4 plants)	Endanger	4	0	0	0	0	1	1	6
VU 11 (Plant 5 + Mammal 1+ Reptile 5)	Vulnerable	5	0	0	0	0	1	5	11
NT 9 (Plant 5 + Amphibians 1 + Bird 1 + Reptile 2)	Near Threaten	5	1	1	0	0	0	2	9
LC 36 (Plants 12 + Amphibians 2 + Birds 7 + Butterfly 1+ Dragonfly 2+ Mammals 2 + Reptiles 10)	Least Concern	12	2	7	1	2	2	10	36
DD1 (Amphibians 1)	Data Deficient	0	1	0	0	0	0	0	1
NE 1 (Bird 1)	Not Evaluated	0	0	1	0	0	0	0	1
	TOTAL	26	4	9	1	2	4	19	65

Annexure 3

Biological wealth of Manewa Kanda ESA

Conservation Status		CR/PE	Critically Endangered	Endanger	Vulnerable	Near Threaten	Least Concern	Data Deficient	Not Evaluated	TOTAL
Plants	Endemic	0	0	4	5	5	12	0	0	26
	Indigenous	1	3	11	37	58	391	7	3	511
	Exotic	0	0	0	0	0	0	0	72	72
Total		1	3	15	42	63	403	7	75	609
Amphibians	Endemic	0	0	0	0	1	2	1	0	4
	Indigenous	0	0	0	1	0	13	1	0	15
Total		0	0	0	1	1	15	2	0	19
Birds	Endemic	0	0	0	0	1	7	0	1	9
	Migratory	0	0	0	0	2	35	0	0	37
	BR	0	1	0	4	15	112	0	0	132
	BR+M	0	3	0	2	1	2	0	0	8
	BR+UM	0	0	1	0	0	0	0	0	1
	PE	0	0	0	0	0	1	0	0	1
Total		0	4	1	6	19	157	0	1	188
Butterfly	Endemic	0	0	0	0	0	1	0	0	1
	Sps Status Not Given	0	0	0	1	0	41	0	0	42
Total		0	0	0	1	0	42	0	0	43
Dragonfly	Endemic	0	0	0	0	0	2	0	0	2
	Indigenous	0	0	0	2	8	28	0	0	38
Total		0	0	0	2	8	30	0	0	40
Mammals	Endemic	0	0	1	0	0	2	0	0	3
	Indigenous	0	0	3	2	2	17	0	0	24
Total		0	0	4	3	2	19	0	0	27
Reptiles	Endemic	0	1	1	5	2	10	0	0	19
	Indigenous	0	0	1	2	8	27	0	0	38
Total		0	1	2	7	10	37	0	0	57
Total		1	8	22	62	103	703	9	76	983

Annexure 4

Summary of threaten spp of Manewa Kanda ESA

Conservation Status	Plants		Amphibians	Bird			Dragonfly	Butterfly	Mammals		Reptiles		Total
	Endemic	Indigenous	Indigenous	BR	BR+M	BR+UM	Indigenous	Sps Status Not Given	Endemic	Indigenous	Endemic	Indigenous	
CR/PE	0	1	0	0	0	0	0	0	0	0	0	0	1
Critically Endangered	0	3	0	1	3	0	0	0	0	0	1	0	8
Endanger	4	11	0	0	0	1	0	0	1	3	1	1	22
Vulnerable	5	37	1	4	2	0	2	1	1	2	5	2	62
TOTAL	9	52	1	5	5	1	2	1	2	5	7	3	93

List of threaten spp of Manewa Kanda ESA

No	BD Group	Location/ Sub-basin	Family	Scientific Name	English Name	Sinhala Name	Species Status	Conservation Status
1	Reptile	Manawa	Scincidae	<i>Nessia hickanala Deraniyagala, 1940</i>	Sharkhead snakeskink	මෝරහිස් සර්පහිරළුවා	Endemic	Critically Endanger
2	Reptile	Manawa	Gekkonidae	<i>Cnemaspis kumarasinghei Mendis Wickramasinghe & Munindradasa, 2007</i>	Kumarasinghe's day gecko	කුමාරසිංහගේ දිවාසර් හුනා	Endemic	Endanger
3	Reptile	Manawa	Gekkonidae	<i>Cyrtodactylus triedra (Günther, 1864)</i>	Spotted bowfinger gecko	පුල්ලි වකහිය හුනා	Endemic	Vulnerable
4	Reptile	Manawa	Scincidae	<i>Nessia sarasinorum (Müller, 1889)</i>	Sarasin's snakeskink	සරසිංහගේ සර්ප හිරළුවා	Endemic	Vulnerable
5	Reptile	Manawa	Gekkonidae	<i>Cnemaspis podihuna Deraniyagala, 1944</i>	Dwarf day gecko	කුඩා දිවාසර් හුනා / පොඩි ගල් හුනා	Endemic	Vulnerable
6	Reptile	Manawa	Scincidae	<i>Eutropis madaraszii (Méhely, 1897)</i>	Spotted skink	පුල්ලි හිකහලා	Endemic	Vulnerable

7	Reptile	Manawa	Gekkonidae	<i>Geckoella yakhuna</i> (Deraniyagala, 1945)	Blotch bowfinger gecko / Demon gecko	ලපවන් වකනිය නූනා / යක් නූනා	Endemic	Vulnerable
No	BD Group	Location/ Sub-basin	Family	Scientific Name	English Name	Sinhala Name	Species Status	Conservation Status
8	Reptile	Manawa	Scincidae	<i>Eutropis beddomii</i> (Jerdon, 1870)	Beddome's stripe skink	වයිරන් භිකනලා	Indigenous	Endanger
9	Reptile	Manawa	Gekkonidae	<i>Lepidodactylus lugubris</i> (Duméril & Bibron, 1836)	Scaly-finger gecko / Mourning gecko	සල්කප නූනා	Indigenous	Vulnerable
10	Reptile	Manawa	Colubridae	<i>Dendrelaphis caudolineolatus</i> (Günther, 1869)	Gunther's bronze back	වීර් කාල්දුණ්ඩා	Indigenous	Vulnerable
11	Mammal	Manawa	Cercopithecidae	<i>Semnopithecus vetulus</i> (Erxleben, 1777)	Purple-faced leaf monkey	ශ්‍රී ලංකා කළු වඳුරා	Endemic	Endanger
12	Mammal	Manawa	Elephantidae	<i>Elephas maximus</i> Linnaeus, 1758	Elephant	අලියා / අනා	Indigenous	Endanger
13	Mammal	Manawa	Felidae	<i>Prionailurus viverrinus</i> (Bennett, 1833)	Fishing cat	හඳුන් දිවියා	Indigenous	Endanger
14	Mammal	Manawa	Felidae	<i>Panthera pardus</i> (Linnaeus, 1758)	Leopard	කොටියා / දිවියා	Indigenous	Endanger
15	Mammal	Manawa	Mustelidae	<i>Lutra lutra</i> (Linnaeus, 1758)	Otter	දිය බල්ලා	Indigenous	Vulnerable
16	Dragonfly	Manawa	Coenagrionidae	<i>Aciagrion occidentale</i> Laidlaw, 1919	Asian Slim	No Sinhala name	indigenous	Vulnerable
17	Dragonfly	Manawa	Libellulidae	<i>Tramea basilaris</i> (Palisot de Beauvois, 1805)	Wheeling Glider/ Keyhole Glider	No Sinhala name	indigenous	Vulnerable
18	Amphibians	Manawa	Bufonidae	<i>Duttaphrynus melanostictus</i> (Schneider, 1799)	Common toad	ගේ ගෙම්බා	Indigenous	Vulnerable
19	Plant	Manawa	Amaranthaceae	<i>Achyranthes diandra</i> Roxb.		No Sinhala Name	Endemic	Endanger
20	Plant	Manawa	Malvaceae	<i>Abutilon subumbellatum</i> Philcox		No Sinhala Name	Endemic	Endanger
21	Plant	Manawa	Rubiaceae	<i>Diyaminauclea zeylanica</i> (Hook.f.) Ridsdale		දිය මී	Endemic	Endanger
22	Plant	Manawa	Dioscoreaceae	<i>Dioscorea trimenii</i> Prain & Bukill		දෙහිය අල	Endemic	Endanger

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23	Plant	Manawa	Acanthaceae	<i>Rhinacanthus flavovirens</i> Amaras. & Wijes.		No Sinhala Name	Endemic	Vulnerable
24	Plant	Manawa	Fabaceae	<i>Painteria nitida</i> (Vahl) Kosterm.		දිය මාර	Endemic	Vulnerable
25	Plant	Manawa	Loranthaceae	<i>Dendrophthoe ligulatus</i> (Thwaites) Tiegh.		No Sinhala Name	Endemic	Vulnerable
26	Plant	Manawa	Malvaceae	<i>Triumfetta glabra</i> Rottler		No Sinhala Name	Endemic	Vulnerable
27	Plant	Manawa	Oleaceae	<i>Chionanthus albidiflorus</i> Thwaites		අඹුල් කොරකහ, තක්කඩ ගස්	Endemic	Vulnerable
28	Plant	Manawa	Malvaceae	<i>Hibiscus panduriformis</i> Burm.f.		No Sinhala Name	Native	Critically Endanger (Possibly Extinct)
29	Plant	Manawa	Amaranthaceae	<i>Aerva javanica</i> (Brum. f.) Juss. ex Schult.		පොල්කුඩු පළා, පොල්පළා	Native	Critically Endanger
30	Plant	Manawa	Fabaceae	<i>Macrotyloma axillare</i> (E. Meyer) Verdc.		No Sinhala Name	Native	Critically Endanger
31	Plant	Manawa	Phyllanthaceae	<i>Sauropus quadrangularis</i> (Willd.) Müll.Arg.		No Sinhala Name	Native	Critically Endanger
32	Plant	Manawa	Acanthaceae	<i>Hygrophila polysperma</i> (Roxb.) T.Anderson		No Sinhala Name	Native	Endanger
33	Plant	Manawa	Acanthaceae	<i>Monothecium aristatum</i> (Nees) T. Anderson		No Sinhala Name	Native	Endanger
34	Plant	Manawa	Cyperaceae	<i>Cyperus clarkei</i> T. Cooke		No Sinhala Name	Native	Endanger
35	Plant	Manawa	Cyperaceae	<i>Cyperus cephalotes</i> Vahl		No Sinhala Name	Native	Endanger
36	Plant	Manawa	Ebenaceae	<i>Diospyros ebenum</i> J.Koenig ex Retz.		කළුවර	Native	Endanger
37	Plant	Manawa	Euphorbiaceae	<i>Croton caudatus</i> Geiseler		වැල් කැප්පෙටියා	Native	Endanger
38	Plant	Manawa	Fabaceae	<i>Ormocarpum sennooides</i> (Willd.) Brenan & J. Leonard		සුදු අවරිය	Native	Endanger

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39	Plant	Manawa	Fabaceae	<i>Teramnus mollis Benth.</i>		වල් කොල්ල	Native	Endanger
40	Plant	Manawa	Fabaceae	<i>Vigna aconitifolia (Jacq.) Marechal</i>	Moth Bean	මකුණිට	Native	Endanger
41	Plant	Manawa	Rubiaceae	<i>Oldenlandia ovatifolia (Cav.) DC.</i>		No Sinhala Name	Native	Endanger
42	Plant	Manawa	Vitaceae	<i>Cissus adnata Roxb.</i>		No Sinhala Name	Native	Endanger
43	Plant	Manawa	Acanthaceae	<i>Dyschoriste depressa Nees</i>		No Sinhala Name	Native	Least Concern
44	Plant	Manawa	Acanthaceae	<i>Dyschoriste madurensis (Brum.f.) Kuntze</i>		No Sinhala Name	Native	Vulnerable
45	Plant	Manawa	Amaranthaceae	<i>Cyathula prostrata (L.) Blume</i>		බිම් කරල්හැඩ	Native	Vulnerable
46	Plant	Manawa	Anacardiaceae	<i>Spondias pinnata (L.f.) Kurz.</i>		වල් අඹරැල්ල	Native	Vulnerable
47	Plant	Manawa	Apocynaceae	<i>Gymnema sylvestre (Retz.) R.Br. Ex Sm.</i>		මස් බැඳි, බිම් නුග	Native	Vulnerable
48	Plant	Manawa	Asteraceae	<i>Erigeron sublyratus Roxb. ex DC.</i>		No Sinhala Name	Native	Vulnerable
49	Plant	Manawa	Asteraceae	<i>Launaea intybacea (Jacq.) Beauverd</i>		No Sinhala Name	Native	Vulnerable
50	Plant	Manawa	Boraginaceae	<i>Trichodesma indicum (L.) Lehm.</i>		No Sinhala Name	Native	Vulnerable
51	Plant	Manawa	Commelinaceae	<i>Cyanotis burmanniana Wight</i>		No Sinhala Name	Native	Vulnerable
52	Plant	Manawa	Convolvulaceae	<i>Ipomoea tuberculata Ker Gawl.</i>		No Sinhala Name	Native	Vulnerable
53	Plant	Manawa	Cucurbitaceae	<i>Gymnopetalum scabrum (Lour.) W.J. de Wilde & Duyfjes</i>		No Sinhala Name	Native	Vulnerable
54	Plant	Manawa	Droseraceae	<i>Drosera burmanni Vahl</i>		වටැස්ස	Native	Vulnerable

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55	Plant	Manawa	Fabaceae	<i>Derris benthamii</i> (Thwaites) Thwaites		හන් කල වැල්	Native	Vulnerable
56	Plant	Manawa	Fabaceae	<i>Dialium ovoideum</i> Thwaites		ගස් සියඹලා	Native	Vulnerable
57	Plant	Manawa	Fabaceae	<i>Indigofera karnatakana</i> Sanjappa		No Sinhala Name	Native	Vulnerable
58	Plant	Manawa	Fabaceae	<i>Indigofera oblongifolia</i> Forssk.		හරි මුං	Native	Vulnerable
59	Plant	Manawa	Fabaceae	<i>Senna auriculata</i> (L.) Roxb.		රණවිරා	Native	Vulnerable
60	Plant	Manawa	Gentianaceae	<i>Hoppea fastigiata</i> (Griseb.) C.B. Clarke		No Sinhala Name	Native	Vulnerable
61	Plant	Manawa	Hydrocharitaceae	<i>Najas minor</i> All.		No Sinhala Name	Native	Vulnerable
62	Plant	Manawa	Icacinaeae	<i>Pyrenacantha volubilis</i> Hook.		No Sinhala Name	Native	Vulnerable
63	Plant	Manawa	Lauraceae	<i>Alseodaphne semecarpifolia</i> Nees		වෘචරණා	Native	Vulnerable
64	Plant	Manawa	Loganiaceae	<i>Strychnos nux-vomica</i> L.		ගොඩ කඳුරු	Native	Vulnerable
65	Plant	Manawa	Loganiaceae	<i>Strychnos potatorum</i> L.f.		ඉඟිහි	Native	Vulnerable
66	Plant	Manawa	Loranthaceae	<i>Taxillus courtallensis</i> (Gamble) Danser		No Sinhala Name	Native	Vulnerable
67	Plant	Manawa	Malvaceae	<i>Abelmoschus ficulneus</i> (L.) Wight & Arn.		No Sinhala Name	Native	Vulnerable
68	Plant	Manawa	Malvaceae	<i>Corchorus olitorius</i> L.		සහි	Native	Vulnerable
69	Plant	Manawa	Menispermaceae	<i>Pachygone ovata</i> (Poir.) Diels		No Sinhala Name	Native	Vulnerable
70	Plant	Manawa	Menispermaceae	<i>Tiliacora acuminata</i> (Lam.) Miers		No Sinhala Name	Native	Vulnerable

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71	Plant	Manawa	Molluginaceae	<i>Mollugo nudicaulis</i> Lam.		No Sinhala Name	Native	Vulnerable
72	Plant	Manawa	Nymphaeaceae	<i>Nymphaea nouchali</i> Burm.f.		මානෙල්	Native	Vulnerable
73	Plant	Manawa	Orchidaceae	<i>Taprobanea spathulata</i> (L.) Christenson		No Sinhala Name	Native	Vulnerable
74	Plant	Manawa	Orchidaceae	<i>Vanda tessellata</i> (Roxb.) Hook. ex G.Don		රාජ්සහ	Native	Vulnerable
75	Plant	Manawa	Phyllanthaceae	<i>Margaritaria indicus</i> (Dalzell) Airy Shaw		කරවි, මහ කරවු	Native	Vulnerable
76	Plant	Manawa	Rubiaceae	<i>Psilanthus wightianus</i> (Wight & Arn.) Leory		No Sinhala Name	Native	Vulnerable
77	Plant	Manawa	Rutaceae	<i>Chloroxylon swietania</i> DC.		බුරුන	Native	Vulnerable
78	Plant	Manawa	Sapotaceae	<i>Manilkara hexandra</i> (Roxb.) Dubard.		පඵ	Native	Vulnerable
79	Plant	Manawa	Solanaceae	<i>Solanum pubescens</i> Willd.		No Sinhala Name	Native	Vulnerable
80	Bird	Manawa	Columbidae	<i>Columba livia</i> Gmelin, 1789	Rock Pigeon	පරවියා	BR	Critically Endanger, Breeding residence
81	Bird	Manawa	Rallidae	<i>Porzana fusca</i> (Linnaeus, 1766)	Ruddy-breasted Crane	ළය රතු විල් කෙරලයිසා	BR	Vulnerable
82	Bird	Manawa	Ciconiidae	<i>Leptoptilos javanicus</i> (Horsfield, 1821)	Lesser Adjutant	හින් බුහුරු මානාවා	BR	Vulnerable
83	Bird	Manawa	Picidae	<i>Chrysocolaptes festivus</i> (Boddaert, 1783)	White-naped Woodpecker	සුදු ගෙලසී මහ කෂරලා	BR	Vulnerable
84	Bird	Manawa	Estrildidae	<i>Lonchura malabarica</i> (Linnaeus, 1758)	White-throated Munia	සරල වී කුරල්ලා	BR	Vulnerable
85	Bird	Manawa	Laridae	<i>Sterna nilotica</i> Gmelin, 1789	Gull-billed Tern	ගලකඩු මුහුදු ප්‍රිතිනියා	BR & M	Critically Endanger
86	Bird	Manawa	Laridae	<i>Sterna albifrons</i> Pallas, 1764	Little Tern	පුංචි මුහුදු ප්‍රිතිනියා	BR & M	Critically Endanger

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87	Bird	Manawa	Meropidae	<i>Merops philippinus Linnaeus, 1766</i>	Blue-tailed Bee-eater	හිල් පෙඳ බිඟුහරයා	BR & M	Critically Endanger
88	Bird	Manawa	Falconidae	<i>Falco tinnunculus Linnaeus, 1758</i>	Common Kestrel	පොදු උකුසුගොයා	BR & UM	Endanger
89	Bird	Manawa	Charadriidae	<i>Charadrius dubius Scopoli, 1786</i>	Little Ringed Plover	පුංචි මාල ඔලෙවියා	BR & M	Vulnerable
90	Bird	Manawa	Charadriidae	<i>Charadrius alexandrinus Linnaeus, 1758</i>	Kentish Plover	කෙන්ට් ඔලෙවියා	BR & M	Vulnerable
91	Butterfly	Manawa	Papilionidae	<i>Papilio crino Fabricius, 1792</i>	Banded Peacock	මයුරබාලා		Vulnerable



**ENHANCING BIODIVERSITY CONSERVATION AND SUSTENANCE OF
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Ministry of Environment

"Sobadam Piyasa", 416/C/1, Robert Gunawardana Mawatha, Battaramulla, Sri Lanka.

Tel : +94-11-2034100 | Web : www.mmde.gov.lk